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**Region 2 Site Assessment Team
EPA CONTRACT EP-W-05-042, TASK ORDER 14**

October 10, 2014

Mr. Andrew Fessler, Contract Officer Representative
U.S. Environmental Protection Agency, Region 2
290 Broadway, 18th Floor
New York, NY 10007-1866

Document Control No. R2-A-14

**Subject: Uniform Federal Policy – Quality Assurance Project Plan
New York Smelter Sites Combined PA/SI Assignments
Contract No. EP-W-05-042, Task Order No. 0014**

Dear Mr. Fessler,

Enclosed please find the final Uniform Federal Policy (UFP) Quality Assurance Project Plan (QAPP), Revision 0 for the Combined Preliminary Assessment/Site Inspection (PA/SI) sampling to be conducted at New York Smelter Sites in the Bronx, Brooklyn, Buffalo, and Syracuse, New York. The document has been revised according to the comments received from EPA on October 3, October 8, and October 10, 2014. If you have any questions or comments, please do not hesitate to contact me at (732) 417-5826.

Sincerely,

A handwritten signature in black ink, appearing to read "Gerald V. Gilliland".

Gerald V. Gilliland, P.G.
Senior Technical Manager

Enclosure

cc:	Task Order 0014 files	D. Breen, WESTON
	M. Gregor, EPA	M. Capriglione, WESTON
	M. Hauptman, EPA	S. Snyder, WESTON
	A. Jackson, EPA	
	C. Romano, EPA	

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**Uniform Federal Policy – Quality Assurance Project Plan
New York Smelter Sites Combined PA/SI Assignments
The Bronx, Brooklyn, Buffalo, and Syracuse, New York**

DCN: R2-A-14
Task Order 0014
EPA Contract No.: EP-W-05-042

Prepared for:

U.S. Environmental Protection Agency Region 2
New York, New York 10007

Prepared By:

Region 2 Site Assessment Team (SAT)
Weston Solutions, Inc.
205 Campus Drive
Edison, New Jersey 08837

October 2014

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Figure 2A – Proposed Alternate Site Sample Locations

Table 2A – Sample Descriptions/Rationale - Alternate Sample Locations

APPENDIX B: Task 1402 – Reliance Lead, Solder & Babbitt Co., Buffalo, NY

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Figure 2 – Proposed Sample Locations

Table 1 – Summary of Analytical Services

Table 2 – Sample Descriptions/Rationale

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Table 2A – Sample Descriptions/Rationale - Alternate Sample Locations

APPENDIX C: Task 1403 – New York Solder Co., The Bronx, NY

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Table 1 – Summary of Analytical Services

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Figure 1 – Site Location Map

Figure 2 – Proposed Sample Locations

Table 1 – Summary of Analytical Services

Table 2 – Sample Descriptions/Rationale

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Figure 1 – Site Location Map

Figure 2 – Proposed Sample Locations

Table 1 – Summary of Analytical Services

Table 2 – Sample Descriptions/Rationale

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Figure 1 – Site Location Map

Figure 2 – Proposed Sample Locations

Table 1 – Summary of Analytical Services

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Figure 1 – Site Location Map

Figure 2 – Proposed Sample Locations

Table 1 – Summary of Analytical Services

Table 2 – Sample Descriptions/Rationale

Figure 2A – Proposed Alternate Site Sample Locations

Table 2A – Sample Descriptions/Rationale - Alternate Sample Locations

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Figure 1 – Site Location Map

Figure 2 – Proposed Sample Locations

Table 1 – Summary of Analytical Services

Table 2 – Sample Descriptions/Rationale

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Figure 1 – Site Location Map

Figure 2 – Proposed Sample Locations

Table 1 – Summary of Analytical Services

Table 2 – Sample Descriptions/Rationale

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Figure 1 – Site Location Map

Figure 2 – Proposed Sample Locations

Table 1 – Summary of Analytical Services

Table 2 – Sample Descriptions/Rationale

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Figure 1 – Site Location Map

Figure 2 – Proposed Sample Locations

Table 1 – Summary of Analytical Services

Table 2 – Sample Descriptions/Rationale

LIST OF ATTACHMENTS

ATTACHMENT 1: Sampling SOPs

EPA/ERT SOP# 2001

EPA/ERT SOP# 2006

EPA/ERT SOP# 2012

ATTACHMENT 2: Analytical Services SOP

EPA Region 2 Laboratory SOP# C-109

LIST OF ABBREVIATIONS AND ACRONYMS

ASR	analytical services request
ASTM	American Society for Testing and Materials
CCB	continuing calibration blank
CCV	continuing calibration verification
CERCLA	Comprehensive Environmental Response, Compensation and Liability Act
CLP	Contract Laboratory Program
COC	chain-of-custody
COR	Contract Officer Representative
CRQL	Contract Required Quantitation Limit
DCN	document control number
DESA	Division of Environmental Science and Assessment
DI	deionized water
DQI	data quality indicator
DQO	data quality objective
EDR	Environmental Data Resources, Inc.
EHS	Environmental Health and Safety
EPA	U.S. Environmental Protection Agency
ERRD	Emergency and Remedial Response Division
ERT	Environmental Response Team
FASTAC	Field and Analytical Services Teaming Advisory Committee
GIS	geographic information systems
GPS	global positioning system
HASP	Health and Safety Plan
HAZWOPER	hazardous waste operations
HRS	Hazard Ranking System
HSO	Health and Safety Officer
HWSB	Hazardous Waste Support Branch
HWSS	Hazardous Waste Support Section
ICB	initial calibration blank
ICP-AES	inductively coupled plasma - atomic emission spectroscopy
ICS	Incident Command Structure
ICV	initial calibration verification
LCS	laboratory control sample
LFB	laboratory fortified blank
mg/kg	milligrams per kilogram
mg/L	milligrams per liter
MPC	measurement performance criterion
MS/MSD	matrix spike/matrix spike duplicate
NELAC	National Environmental Laboratory Accreditation Conference
NYCDPR	New York City Department of Parks and Recreation
NYCHA	New York City Housing Authority
NYSDEC	New York State Department of Environmental Conservation
OSC	On-Scene Coordinator
OSHA	Occupational Safety and Health Administration

LIST OF ACRONYMS (Concluded)

OSWER	Office of Solid Waste and Emergency Response
PARCC	precision, accuracy, representativeness, completeness, comparability
PA/SI	Preliminary Assessment/Site Inspection
PAH	polynuclear aromatic hydrocarbon
PID	photoionization detector
PCB	polychlorinated biphenyl
PM	Program Manager
PO	Project Officer
PQO	project quality objective
PRS	Pre-Remedial Section
QA	quality assurance
QAO	Quality Assurance Officer
QAPP	Quality Assurance Project Plan
QA/QC	quality assurance/quality control
QC	quality control
RAB	Removal Action Branch
RL	reporting limit
RML	Removal Management Level
ROW	right-of-way
RPD	relative percent difference
RSCC	Regional Sample Control Coordinator
RSE	Removal Site Evaluation
SAT	Site Assessment Team
SM	Site Manager
SMD	Standard Metal Directory
SOP	standard operating procedure
SPB	Special Projects Branch
SST	Superfund Support Team
STR	Sampling Trip Report
SVOC	semivolatile organic compound
TAL	Target Analyte List
TBD	to be determined
TCLP	Toxicity Characteristic Leaching Procedure
TO	task order
TOCOR	Task Order Contract Officer Representative
UFP	Uniform Federal Policy
VOC	volatile organic compound
WESTON	Weston Solutions, Inc.

CROSSWALK

The following table provides a “cross-walk” between the QAPP elements outlined in the Uniform Federal Policy for Quality Assurance Project Plans (UFP-QAPP Manual), the necessary information, and the location of the information within the text document and corresponding QAPP Worksheet. Any QAPP elements and required information that are not applicable to the project are circled.

QAPP Element(s) and Corresponding Section(s) of UFP-QAPP Manual			Required Information		Crosswalk to QAPP Section	Crosswalk to QAPP Worksheet No.	
Project Management and Objectives							
2.1	Title and Approval Page		-	Title and Approval Page	Approval Page	1	
2.2	Document Format and Table of Contents		-	Table of Contents	TOC	2	
	2.2.1	Document Control Format	-	QAPP Identifying Information	Approval Page		
	2.2.2	Document Control Numbering System					
	2.2.3	Table of Contents					
	2.2.4	QAPP Identifying Information					
2.3	Distribution List and Project Personnel Sign-Off Sheet		-	Distribution List	Approval Page	3	
	2.3.1	Distribution List	-	Project Personnel Sign-Off Sheet		4	
	2.3.2	Project Personnel Sign-Off Sheet					
2.4	Project Organization		-	Project Organizational Chart	2	5	
	2.4.1	Project Organizational Chart	-	Communication Pathways		6	
	2.4.2	Communication Pathways	-	Personnel Responsibilities and Qualifications		7	
	2.4.3	Personnel Responsibilities and Qualifications	-	Responsibilities and Qualifications		8	
	2.4.4	Special Training Requirements and Certification	-	Special Personnel Training Requirements			
2.5	Project Planning/Problem Definition		-	Project Planning Session Documentation (including Data Needs tables)	1	9	
	2.5.1	Project Planning (Scoping)	-	Project Scoping Session Participants Sheet			10
	2.5.2	Problem Definition, Site History, and Background	-	Problem Definition, Site History, and Background			
			-	Site Maps (historical and present)			
2.6	Project Quality Objectives and Measurement Performance Criteria		-	Site-Specific PQOs	3	11	
	2.6.1	Development of Project Quality Objectives Using the Systematic Planning Process	-	Measurement Performance Criteria		12	
	2.6.2	Measurement Performance Criteria					
2.7	Secondary Data Evaluation		-	Sources of Secondary Data and Information	1	13	
			-	Secondary Data Criteria and Limitations	2		

UFP QAPP, New York Smelter Sites
Document Control No. R2-A-14, Rev. 0

QAPP Element(s) and Corresponding Section(s) of UFP-QAPP Manual		Required Information	Crosswalk to QAPP Section	Crosswalk to QAPP Worksheet No.
2.8	Project Overview and Schedule	- Summary of Project Tasks	4	14
2.8.1	Project Overview	- Reference Limits and Evaluation		15
2.8.2	Project Schedule	- Project Schedule/Timeline		16
Measurement/Data Acquisition				
3.1	Sampling Tasks	- Sampling Design and Rationale	5	17
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3.1.2.2	Sample Containers, Volume, and Preservation	- Field Quality Control		21
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3.1.2.4	Field Equipment Calibration, Maintenance, Testing, and Inspection Procedures	- Project Sampling SOP References		22
3.1.2.5	Supply Inspection and Acceptance Procedures	- Field Equipment Calibration, Maintenance, Testing, and Inspection		
3.1.2.6	Field Documentation Procedures			
3.2	Analytical Tasks	- Analytical SOPs	6	23
3.2.1	Analytical SOPs	- Analytical SOP References		24
3.2.2	Analytical Instrument Calibration Procedures	- Analytical Instrument Calibration		25
3.2.3	Analytical Instrument and Equipment Maintenance, Testing, and Inspection Procedures	- Analytical Instrument and Equipment Maintenance, Testing, and Inspection		
3.2.4	Analytical Supply Inspection and Acceptance Procedures			
3.3	Sample Collection Documentation, Handling, Tracking, and Custody Procedures	- Sample Collection Documentation Handling, Tracking, and Custody SOPs	7	26
3.3.1	Sample Collection Documentation	- Sample Container Identification		27
3.3.2	Sample Handling and Tracking System	- Sample Handling Flow Diagram		
3.3.3	Sample Custody	- Example Chain-of-Custody Form and Seal		
3.4	Quality Control Samples	- QC Samples	5	28
3.4.1	Sampling Quality Control Samples	- Screening/Confirmatory Analysis Decision Tree		
3.4.2	Analytical Quality Control Samples			

UFP QAPP, New York Smelter Sites
Document Control No. R2-A-14, Rev. 0

QAPP Element(s) and Corresponding Section(s) of UFP-QAPP Manual		Required Information	Crosswalk to QAPP Section	Crosswalk to QAPP Worksheet No.
3.5	Data Management Tasks	- Project Documents and Records	6	29
3.5.1	Project Documentation and Records	- Analytical Services		30
3.5.2	Data Package Deliverables	- Data Management SOPs		
3.5.3	Data Reporting Formats			
3.5.4	Data Handling and Management			
3.5.5	Data Tracking and Control			
Assessment/Oversight				
4.1	Assessments and Response Actions	- Assessments and Response Actions	8	31
4.1.1	Planned Assessments	- Planned Project Assessments		32
4.1.2	Assessment Findings and Corrective Action Responses	- Audit Checklists		
		- Assessment Findings and Corrective Action Responses		
4.2	QA Management Reports	- QA Management Reports		33
4.3	Final Project Report	- Final Report(s)		
Data Review				
5.1	Overview			
5.2	Data Review Steps	- Verification (Step I) Process	9	34
5.2.1	Step I: Verification	- Validation (Steps IIa and IIb) Process		35
5.2.2	Step II: Validation	- Validation (Steps IIa and IIb) Summary		36
	5.2.2.1 Step IIa Validation Activities	- Usability Assessment		37
	5.2.2.2 Step IIb Validation Activities			
5.2.3	Step III: Usability Assessment			
	5.2.3.1 Data Limitations and Actions from Usability Assessment			
	5.2.3.2 Activities			

QAPP Worksheet #1: Title and Approval Page

Title: UFP Quality Assurance Project Plan (QAPP)

Site Name/Project Name: New York Smelter Sites

Site Location: various – The Bronx, Brooklyn, Buffalo, and Syracuse, NY (see site-specific attachments for street addresses)

Revision Number: 0

Revision Date: September 2014

EPA Region 2 Pre-Remedial Section (ERRD-SPB-PRS)

Lead Organization

Gerald Gilliland, Weston Solutions, Inc. (WESTON®) Region 2 Site Assessment Team (SAT)

Preparer's Name and Organizational Affiliation

10 October 2014

Preparation Date (Day/Month/Year)

Project Manager:



Signature

Gerald Gilliland/WESTON Region 2 SAT

Printed Name/Organization/Date

QA Representative/Technical Reviewer:



Signature

Scott Snyder/WESTON Region 2 SAT

Printed Name/Organization/Date

**EPA Region 2 Task Order Contract Officer
Representative (TOCOR) Designee:**



Signature

Andrew Fessler/EPA Region 2 ERRD-SPB-PRS

Printed Name/Organization/Date

EPA Region 2 On-Scene Coordinator (OSC):

Signature

Margaret Gregor/EPA Region 2 Removal Action Branch (ERRD-RAB)

Printed Name/Organization/Date

**EPA Region 2 Quality Assurance Officer
(QAO):**

Signature

Amelia Jackson/EPA Region 2 Superfund Support Team (DESA- HWSB- SST)

Printed Name/Organization/Date

QAPP Worksheet #1: Title and Approval Page

Title: UFP Quality Assurance Project Plan (QAPP)
Site Name/Project Name: New York Smelter Sites
Site Location: various – The Bronx, Brooklyn, Buffalo, and Syracuse, NY (see site-specific attachments for street addresses)
Revision Number: 0
Revision Date: September 2014

EPA Region 2 Pre-Remedial Section (ERRD-SPB-PRS)

Lead Organization

Gerald Gilliland, Weston Solutions, Inc. (WESTON[®]) Region 2 Site Assessment Team (SAT)

Preparer's Name and Organizational Affiliation

10 October 2014

Preparation Date (Day/Month/Year)

Project Manager:




Signature

Gerald Gilliland/WESTON Region 2 SAT

Printed Name/Organization/Date

QA Representative/Technical Reviewer:



Signature

Scott Snyder/WESTON Region 2 SAT

Printed Name/Organization/Date

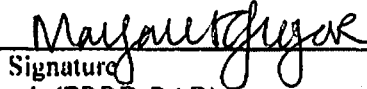
**EPA Region 2 Task Order Contract Officer
Representative (TOCOR) Designee:**

Signature

Andrew Fessler/EPA Region 2 ERRD-SPB-PRS

Printed Name/Organization/Date

EPA Region 2 On-Scene Coordinator (OSC):



Signature

Margaret Gregor/EPA Region 2 Removal Action Branch (ERRD-RAB)

Printed Name/Organization/Date

**EPA Region 2 Quality Assurance Officer
(QAO):**



Signature

Amelia Jackson/EPA Region 2 Superfund Support Team (DESA- IIWSB- SST)

Printed Name/Organization/Date

QAPP Worksheet #2: QAPP Identifying Information

Site Name/Project Name: New York Smelter Sites

Site Location: various – The Bronx, Brooklyn, Buffalo, and Syracuse, NY (see site-specific attachments for street addresses)

Operable Unit: 00

Title: UFP QAPP

Revision Number: 0

Revision Date: September 2014

1. Identify guidance used to prepare QAPP:

Uniform Federal Policy for Quality Assurance Project Plans (UFP-QAPP Manual)
EPA Region 2 standard operating procedures (SOP)

2. Identify regulatory program: EPA Region 2

3. Identify approval entity: EPA Region 2

4. Indicate whether the QAPP is a generic or a site-specific QAPP. Site-Specific (11 sites)

5. List dates of scoping sessions that were held: August 12, 2014

6. List dates and titles of QAPP documents written for previous site work, if applicable:

Round 1 New York Smelter Site PA/SI QAPPs:

- Brookhattan Smelting & Refining Co. (March and June 2013)
- Neo Smelting & Refining (March 2013)
- AMA Div. of the Ore and Chemical Corp. (March 2013)

7. List organizational partners (stakeholders) and connection with lead organization:

EPA Region 2 ERRD-RAB will be utilizing the data in Removal Site Evaluations (RSE) and to determine if additional sampling by ERRD-RAB is required.

8. If any required QAPP elements and required information are not applicable to the project, then provide an explanation for their exclusion below:

None

9. Document Control Number: R2-A-14

QAPP Worksheet #3: Distribution List

[List those entities to which copies of the approved QAPP, subsequent QAPP revisions, addenda, and amendments are sent]

QAPP Recipient	Title	Organization	Telephone Number	E-mail Address	Document Control Number
Andrew Fessler	TOCOR Designee	EPA Region 2	(212) 637-4333	Fessler.Andrew@epa.gov	R2-A-14
Margaret Gregor	On-Scene Coordinator	EPA Region 2	(732) 321-4424	Gregor.Margaret@epa.gov	R2-A-14
Amelia Jackson	Quality Assurance Officer	EPA Region 2	(732) 906-6164	Jackson.Amelia@epa.gov	R2-A-14
Gerry Gilliland	Program Manager	Region 2 SAT	(732) 417-5826	Gerry.Gilliland@westonsolutions.com	R2-A-14
Scott Snyder	Site Manager	Region 2 SAT	(732) 417-5828	S.Snyder@westonsolutions.com	R2-A-14
Denise Breen	Site Manager	Region 2 SAT	(732) 417-5814	Denise.Breen@westonsolutions.com	R2-A-14
Michele Capriglione	Site Manager	Region 2 SAT	(732) 417-5808	M.Capriglione@westonsolutions.com	R2-A-14
Task Order 14 file	Region 2 SAT TO14 file	Region 2 SAT	N/A	N/A	R2-A-14

EPA – U.S. Environmental Protection Agency
SAT – Site Assessment Team
TO – Task Order

QAPP Worksheet #4: Project Personnel Sign-Off Sheet

[Copies of this form signed by key project personnel from each organization to indicate that they have read the applicable sections of the QAPP and will perform the tasks as described; add additional sheets as required. Ask each organization to forward signed sheets to the central project file.]

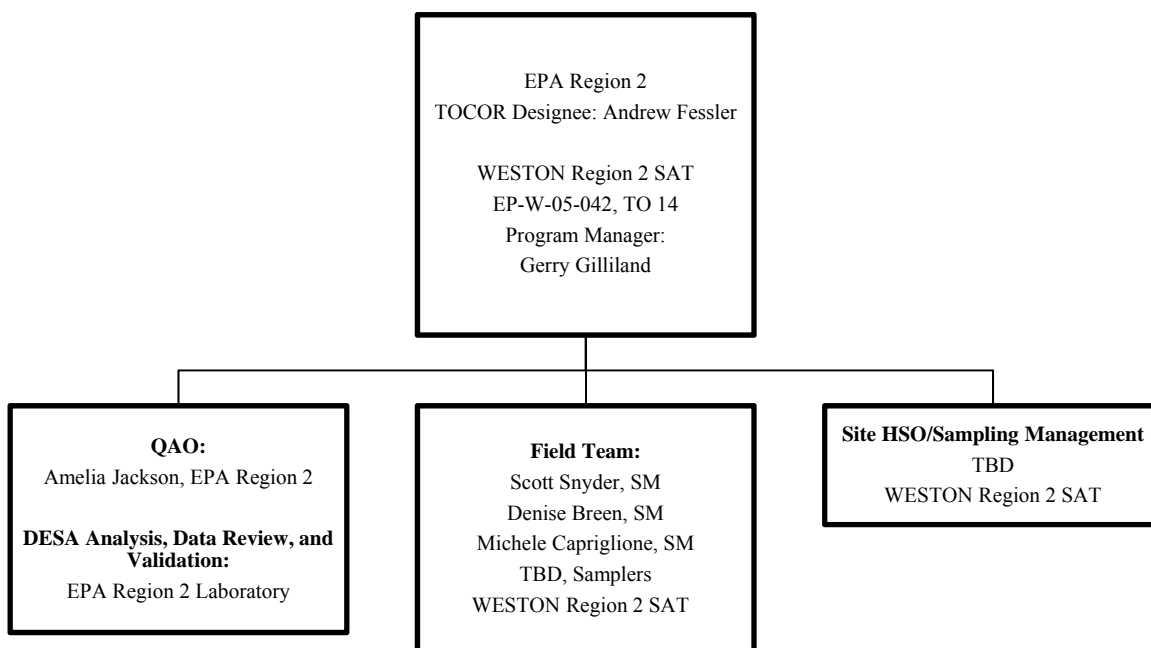
Organization: EPA Region 2 /
WESTON Region 2 SAT

Project Personnel	Title	Telephone Number	Signature	Date QAPP Read
Andrew Fessler	TOCOR Designee, EPA Region 2	(212) 637-4333		
Margaret Gregor	OSC, EPA Region 2	(732) 321-4424		
Gerry Gilliland	Program Manager, Region 2 SAT	(732) 417-5826		
Scott Snyder	Site Manager, Region 2 SAT	(732) 417-5828		
Denise Breen	Site Manager, Region 2 SAT	(732) 417-5814		
Michele Capriglione	Site Manager, Region 2 SAT	(732) 417-5808		
TBD	Field Personnel, Region 2 SAT	(732) 417-5800		
TBD	Field Personnel, Region 2 SAT	(732) 417-5800		
TBD	Field Personnel, Region 2 SAT	(732) 417-5800		

TOCOR – Task Order Contract Officer Representative
EPA – U.S. Environmental Protection Agency
OSC – On-Scene Coordinator
SAT – Site Assessment Team
TBD – to be determined

QAPP Worksheet #5: Project Organizational Chart

Identify reporting relationship between all organizations involved in the project, including the lead organization and all contractor and subcontractor organizations. Identify the organizations providing field sampling, on-site and off-site analysis, and data review services, including the names and telephone numbers of all project managers, project team members, and/or project contacts for each organization.



Acronyms:

DESA - Division of Environmental Science and Assessment
EPA – U.S. Environmental Protection Agency
HSO – Health & Safety Officer
QAO – Quality Assurance Officer
SAT – Site Assessment Team
SM – Site Manager
TO – Task Order
TOCOR – Task Order Contract Officer Representative

QAPP Worksheet #6: Communication Pathways

Communication Drivers	Responsible Entity	Name	Phone Number	Procedure
Point of contact with EPA TOCOR Designee	PM, Region 2 SAT SMs, Region 2 SAT	Gerry Gilliland Scott Snyder Denise Breen Michele Capriglione	(732) 417-5826 (732) 417-5828 (732) 417-5814 (732) 417-5808	All technical, QA and decision-making matters in regard to the project (verbal, written or electronic)
Adjustments to QAPP	PM, Region 2 SAT SMs, Region 2 SAT	Gerry Gilliland Scott Snyder Denise Breen Michele Capriglione	(732) 417-5826 (732) 417-5828 (732) 417-5814 (732) 417-5808	QAPP approval dialogue
Health and Safety On-Site Meeting	HSO, WESTON Region 2 SAT	TBD	(732) 417-5800	Explain/review site hazards, personnel protective equipment, hospital location, etc.

HSO – Health and Safety Officer
PM –Program Manager
QA – Quality Assurance
QAPP – Quality Assurance Project Plan
SAT – Site Assessment Team
SM – Site Manager
TOCOR – Task Order Contract Officer Representative

QAPP Worksheet #7: Personnel Responsibilities and Qualifications Table

Name	Title	Organizational Affiliation	Responsibilities	Education and Experience Qualifications
Andrew Fessler	EPA TOCOR Designee	EPA Region 2	All project coordination, direction and decision making.	NA
Gerry Gilliland	Program Manager, Region 2 SAT	Weston Solutions, Inc.	Implementing and executing the technical, QA and health and safety during sampling event and sample collection and management	27 years*
Scott Snyder	Site Manager, HSO, Region 2 SAT	Weston Solutions, Inc.	Sample collection, health and safety during sampling event and management	15 Years*
Denise Breen	Site Manager, Region 2 SAT	Weston Solutions, Inc.	Sample collection, health and safety during sampling event and management	2 Years*
Michele Capriglione	Site Manager, Region 2 SAT	Weston Solutions, Inc.	Sample collection, health and safety during sampling event and management	13 Years*
TBD	Field Personnel, Region 2 SAT	Weston Solutions, Inc.	Sample collection, health and safety during sampling event and management	TBD
TBD	Field Personnel, Region 2 SAT	Weston Solutions, Inc.	Sample collection, health and safety during sampling event and management	TBD

* The Region 2 SAT Program Manager retains copies of all Region 2 SAT member resumes.

EPA – U.S. Environmental Protection Agency

HSO – Health and Safety Officer

QA – Quality Assurance

SAT – Site Assessment Team

TBD – to be determined

TOCOR – Task Order Contract Officer Representative

QAPP Worksheet #8: Special Personnel Training Requirements Table

Project Function	Specialized Training By Title or Description of Course	Training Provider	Training Date	Personnel/ Groups Receiving Training	Personnel Titles/ Organizational Affiliation	Location of Training Records/ Certificates¹
QAPP Training	Personnel are introduced to provisions, requirements, and responsibilities detailed in the UFP QAPP, and to relationships between UFP QAPPs, SOPs, work plans, and Generic QAPP. QAPP refresher training will be presented to Region 2 SAT personnel following a major QAPP revision, if applicable.	WESTON Region 2 SAT	As needed	Region 2 SAT field personnel upon initial employment and as refresher training, as needed	Weston Solutions, Inc.	N/A
Health and Safety Training	Health and safety training will be provided to ensure compliance with Occupational Safety and Health Administration (OSHA) as established in 29 CFR 1910.120.	WESTON HSO	Initial 40-hour training and annual 8-hour refresher	Region 2 SAT employees performing HAZWOPER work	Weston Solutions, Inc.	WESTON EHS Database
Others	Scribe, ICS 100 and 200, and Air Monitoring Equipment Training provided to all employees	WESTON and online training	Upon initial employment and as needed	Region 2 SAT employees as needed		
	Dangerous Goods Shipping	WESTON HSO	Every 2 years	Region 2 SAT employees as needed		

EHS – Environmental Health and Safety
HAZWOPER – hazardous waste operations
HSO – Health and Safety Officer
ICS – Incident Command Structure
QAPP – Quality Assurance Project Plan
SAT – Site Assessment Team
SOP – standard operating procedure
UFP – Uniform Federal Policy

QAPP Worksheet #9: Project Scoping Session Participants Sheet

Site Name/Project Name: New York Smelter Sites

Site Location: various – The Bronx, Brooklyn, Buffalo, and Syracuse, NY (see site-specific attachments for street addresses)

Operable Unit: 00

Date of Sessions: August 12, 2014

Scoping Session Purpose: To discuss questions, comments, and assumptions regarding technical issues involved with the investigation of the sites

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DESA – Division of Environmental Science and Assessment

EPA – U.S. Environmental Protection Agency

HWSB – Hazardous Waste Support Branch

SAT – Site Assessment Team

TOCOR – Task Order Contract Officer Representative

Comments/Decisions: WESTON Region 2 SAT is tasked with the advancement of boreholes and collection of grab soil samples from the locations of eleven former secondary smelters and surrounding areas. The boreholes for this phase of the investigation (i.e., Preliminary Assessment/Site Inspection [PA/SI] sampling) will be advanced with hand augers to the depth of 2 feet below ground surface (bgs), and soil samples will be collected at the depth intervals of 0-1, 1-6, 6-12, 12-18, and 18-24 inches bgs in each borehole. Quality assurance/quality control (QA/QC) samples will be collected as required. The samples will be collected to determine if operations at the former secondary smelters may potentially have impacted the soils near the footprint of the former facility. Samples will also be collected upwind and downwind (based on annual average wind rose charts) to document background conditions and release conditions, respectively. If any site is paved or on-site soil is otherwise inaccessible, off-site sample results and locations will be used to determine if the site needs a second phase (e.g., on-site samples with direct-push or other drilling methods).

As requested by EPA, this QAPP covers the general requirements for PA/SI sampling at all eleven sites, which are located in the Bronx, Brooklyn, Buffalo, and Syracuse, New York. Site-specific information and proposed sampling frequencies/locations are presented in Appendices A through K. In general, each SI will consist of four background boreholes, two to four on-site boreholes, and six off-site/downwind boreholes. All sample locations will be at least 2 feet from buildings (i.e., not within the drip-line). Sampling is tentatively scheduled to begin with the Bronx and Brooklyn sites in October and November 2014.

The soil samples collected by Region 2 SAT will be submitted to the EPA Region 2 Laboratory for Target Analyte List (TAL) Metals and Tin analysis (excluding mercury [Hg] and cyanide [CN⁻]). The soil samples will be collected for a definitive data QA Objective. Field duplicate and matrix spike/matrix spike duplicate (MS/MSD) samples will be collected at a rate of one per twenty soil samples or one per batch of less than twenty samples. Rinsate blanks will be collected in conjunction with the use of non-dedicated sampling equipment that requires decontamination, specifically hand augers. Soil samples will be collected in 4-oz. jars. Soil samples collected from the 0-1 inch interval will be designated for sieving at the laboratory with a 250-micron, stainless-steel sieve and pan; Region 2 SAT will indicate this information on the chain-of-custody (COC) forms to ensure implementation by the Region 2 Laboratory. The turnaround time for analytical results from the laboratory will be 60 days from sample receipt at the laboratory, and the Region 2

Laboratory will provide the results to the EPA Region 2 ERRD-Hazardous Waste Support Section (HWSS) for upload to the HWSS Quickr website.

The analytical results will be compared to three times (3x) the site-specific background levels for the pre-remedial evaluation and to Removal Management Levels (RML) published June 2014 for the removal site evaluation. The primary contaminants of concern are lead [Pb], antimony [Sb], arsenic [As], cadmium [Cd], copper [Cu], tin [Sn], and zinc [Zn].

Action Items:

Region 2 SAT will submit separate, site-specific analytical services request (ASR) forms for laboratory procurement in September 2014 [Note: ASRs for all sites were submitted in September 2014 and revised and submitted in October 2014]. Region 2 SAT requests on each ASR that sieving is required for the 0-1 inch interval samples and that the results be posted to the HWSS Quickr website, and will include the same requirements on COCs. DESA-HWSB-SST will ensure that the Region 2 Laboratory is performing the sieving and providing the files to HWSS for upload to Quickr.

Consensus Decisions:

Prior to commencement of sampling activities, EPA will notify State and municipal offices as necessary. The EPA Task Order Contract Officer Representative (TOCOR) designee and On-Scene Coordinators (OSC) will contact site property owners and operators to obtain access to on-site sample locations. If a site is inaccessible, samples will be collected from an adjacent right-of-way (ROW) if possible. WESTON Region 2 SAT will contact property owners and municipal departments to gain access to off-site sample locations. Off-site and background samples in ROWs, parks, churches, and cemeteries are preferred. Access to private residences will be requested only if necessary (e.g., on-site or adjacent residences). WESTON Region 2 SAT will communicate with local police departments for sites with potential security issues.

QAPP Worksheet #10: Problem Definition

PROBLEM DEFINITION

EPA has assigned WESTON Region 2 SAT to complete Combined PA/SI evaluations for 11 former secondary smelter sites located in the State of New York. The subject properties were included in a list of hundreds of locations nationwide where secondary lead smelting or alloying might have been conducted between 1931 and 1964. The list was originally compiled by William P. Eckel in a doctoral dissertation for George Mason University and was based on entries in historical trade publications. The research was summarized in the article “Discovering Unrecognized Lead-Smelting Sites by Historical Methods” (Eckel et al., 2001), which was published in the American Journal of Public Health. Additional evidence exists that secondary smelting occurred at all 11 subject properties, which are located in the Bronx, Brooklyn, Buffalo, and Syracuse (see “Site History/Conditions” below).

Smelting is a key process in lead production that involves heating lead ore (primary smelting) or recovered lead (secondary smelting) with chemical reducing agents. The secondary smelting process can be responsible for releasing large amounts of lead contamination into the surrounding environment; therefore, the potential of lead releases to surrounding properties might have existed while the former smelters were in operation. As part of the PA/SI evaluations, Region 2 SAT is tasked with the collection of soil samples from the former smelter locations and nearby properties. The analytical data from these investigations will be used to assist EPA in determining if contaminated soil exists on the sites that were once occupied by secondary lead smelters, and to evaluate the possibility of historical airborne releases to properties in the surrounding areas. In August 2014, WESTON Region 2 SAT performed reconnaissance activities to identify accessible soil sample locations for evaluation of possible historical lead releases at and in the vicinities of the 11 former smelters.

SITE HISTORY/CONDITIONS

WESTON has assigned a unique task number to each of the former smelter PA/SI assignments. The available information for each site is presented below according to the task numbers:

Task 1401 - Buffalo White Metal Co., 328 Howard Street, Buffalo, NY 14206

The Buffalo White Metal Co. (BWM) facility appears to have been a secondary smelter from at least 1950 to approximately 1981, and possibly for at least eight additional years prior to that time period. Available Sanborn maps and city directories indicate that the subject property was occupied by a scrap metal facility from at least 1946 until 1981. An historical newspaper article indicates that the Harry Fox & Co. and the attached adjacent BWM were operational scrap metal facilities in 1942. The 1950 and 1981 Sanborn maps indicate that “Scrap Metal” and “melting furnaces” were present on the subject property. The 1950 Sanborn map indicates that the property was occupied by “Harry Fox & Co.” Additionally, a 1958 aerial photograph indicates the probable presence of smokestacks at the southeastern and northeastern corners of the building. The general location of the southeastern smokestack corresponds to the melting furnace locations noted on the Sanborn maps.

On April 1 and August 25, 2014, WESTON personnel visited the former location of 328 Howard Street in Buffalo, New York, the reported address of the former BWM (a.k.a. Harry Fox Metal Co.) facility as indicated in the 2001 Eckel report, city directories, and on available Sanborn maps. The subject property is located in a mixed commercial, industrial, and residential area. The address of the subject property is no longer present on Howard Street. The subject property currently consists of an asphalt-paved parking lot. The parking lot is associated with the Sahlen's Packing Company, a meat packing facility located at 318 Howard Street. A small strip of grass borders the parking lot to the north and east. Access to the parking lot is restricted by a fence and automated gate. Residential properties with grass-covered yards border the former scrap metal facility to the north, northeast, and east; inactive commercial and industrial properties are located to the south across Howard Street. Additional residential areas lie further southwest and north-northeast of the subject property.

A review of historical aerial photographs indicate that the residential neighborhood located adjacent to the site on the northeast was constructed sometime between 1983 and 1995, the same time period when the building on the subject property was razed and replaced by a parking lot. Prior to the construction of the residential neighborhood, this area contained a playground and baseball fields. According to available wind rose plots, the prevailing wind direction in Buffalo is approximately southwest to northeast, indicating that the residential neighborhood is downwind of the former smelter location. Observations made during the August 2014 reconnaissance indicate a sufficient number of potential soil sampling locations within public ROWs in residential neighborhoods of varying age, both upwind and downwind of the site, to evaluate if historical releases of lead have occurred.

Task 1402 – Reliance Lead, Solder & Babbitt Co. Inc., 399 Genesee Street (historical), Buffalo, NY 14204

The Reliance Lead, Solder & Babbitt Co. Inc. (Reliance) facility was operational as early as 1935 to approximately 1964. Available city directories listed Reliance Lead, Solder & Babbitt Co. at 399 Genesee Street in 1940, 1946, 1950, 1955, and 1964. Prior to and after that timeframe, the property is listed as vacant. Available Sanborn maps indicate that the subject property was developed as early as 1889, and was occupied by a store and contained a shed until at least 1926. The 1950 Sanborn map indicates “Solder & Babbitt Smeltering” and “melting pots” at the subject property. An historical newspaper article dated November 28, 1948 states that the Reliance Lead, Solder & Babbitt Co. located at 399 Genesee Street “smelts and refines lead, solder, babbitt, scrap metal, drosses, or skimmings down into ingots. The facility then blends the metals to make different alloys.” The news article stated that the company had been in operation since 1935. The 1986 Sanborn map (i.e., the next available map after 1950) depicts the property as vacant. A review of historical aerial photographs dated 1938, 1943, 1959, and 1966 indicates that the area surrounding the former smelter was more heavily urbanized than it is today. Due to the small size of the former smelter and the scale and quality of the aerial photographs, specific features of the facility (such as smokestacks or chimneys) and surrounding area (presence and amount of exposed soil) are difficult to discern during this timeframe. The aerial photographs indicate that the on-site building was razed sometime between 1966 and 1983, as well as

numerous other buildings and dwellings in the area; the photographs depict the surrounding area as currently less dense, with larger areas of exposed soil.

On April 1 and August 25, 2014, WESTON personnel visited the approximate location of 399 Genesee Street in Buffalo, NY, the reported address of the former Reliance facility as indicated in the 2001 Eckel report, city directories, and on available Sanborn maps. The subject property is located in a predominantly residential area with some light industrial and commercial properties to the north, east, and west along Genesee Street. The subject property is currently vacant and consists of a maintained grassy area. Access to the property is unrestricted. Residential properties with grass-covered yards are adjacent to the southern end of the former historical smelter to the south, west, and east along Pratt Street and Spring Street. Additionally, an in-home daycare facility was identified at 580 Spring Street, south of the former smelter; outdoor play equipment was observed in the yard.

A review of historical topographic maps indicates that a school was located to the southwest of the subject property across Pratt Street. WESTON observed that this location is currently used as a community center. Exposed soil is present; however, no outdoor play areas associated with the community center are present. According to available wind rose plots, the prevailing wind direction in Buffalo is approximately southwest to northeast, suggesting that the residential neighborhood, community center, and in-home day care center would be predominantly upwind of the former smelter location. Observations made during the August 2014 site reconnaissance indicate a sufficient number of potential soil sampling locations within public ROWs in residential neighborhoods of varying age, both upwind and downwind of the site, to evaluate if historical releases of lead have occurred. A potential soil sampling location was also identified on the community center property upwind of the site.

Task 1403 – New York Solder Co., 684 E. 133rd Street, Bronx, NY 10454

The operational history of the New York Solder Co. as a smelter is substantially documented. According to available records, New York Solder Co. incorporated in January 1930. Available Sanborn maps indicate that the facility at 684–686 East 133rd Street had been constructed by 1935, yet stood vacant at that time. A “bottle printing” company occupied the facility in 1946–1947, after which the facility is labeled as “N.Y. Solder Co. Inc. solder mfg” on all Sanborn maps from 1951 through 2007 (i.e., the most recent map). The Sanborn maps indicate that the building covers the entire property. The building, including a billboard on the roof, is also visible in aerial photographs dated from 1941 to 2011. The Sanborn maps and aerial photographs show the presence of four residential properties with yard areas adjacent to the back wall of the facility, and several additional residential properties with yard areas across the street to the northeast. According to the City Directory Abstract for the subject address, NY Solder Co. Inc. was listed in city directories dated 2000 and 2005, and Precise Alloys Corp. was also listed at the address in 2000. The subject address was not listed in city directories prior to 2000, and NY Solder Co. Inc. was not listed for any adjoining property addresses at any time.

The subject property is not known to be listed in any environmental databases. However, the Occupational Safety and Health Administration (OSHA) investigated the New York Solder Co., Inc. facility from March to September 2002, identifying the company as a manufacturer of solder

wire and bar solder from lead-based alloys. OSHA cited and fined the company for numerous violations of federal safety and health standards for exposure to lead. The violations listed above are considered to be evidence that New York Solder Co., Inc. was operating as a smelter at the facility until at least September 2002. According to available records, the company continued to submit biannual reports to the State of New York until 2008, and proclaimed dissolution in October 2009.

On November 13, 2012, and August 14, 2014, EPA visited 684 East 133rd Street in the Bronx, NY, the address of New York Solder Co. as indicated in Eckel's report, Sanborn maps, and city directories. The site is located east of the northern terminus of the Robert F Kennedy Bridge (formerly known as the Triborough Bridge). The reconnaissance confirmed that the building covers the entire subject property to the edges of the sidewalk. Currently the site is being used as a Twins Electric supply warehouse. There is no exposed soil on site. It is unclear from the available Sanborn maps and aerial photographs if the building has or had chimneys or smokestacks, although small roof features resembling chimneys were observed during the reconnaissance in 2012. Adjacent to the southwest side of the former facility are four residential properties; exposed soil was observed at the residence located at 685 E. 132nd Street and possibly at other residential properties located on E. 132nd Street. Historical and current aerial photographs show other occurrences of exposed soil adjacent to and across the street from the subject building. There are numerous residences on both sides of East 133rd Street. Playground One Thirty Four is located approximately 0.09 mile northwest of the subject property and has exposed soil. Exposed soil is located within the ROWs located on the on-ramp for Bruckner Boulevard at E. 133rd Street. Additional exposed soil is located on the Bronx Sanitation District office property located approximately 0.05–0.08 mile south from the site.

Task 1404 – Lumen Bearing Co., 197 Lathrop Street, Buffalo, NY 14212

The Lumen Bearing Co. (Lumen) facility was operational as a foundry as early as 1893 and as a smelter from 1926 to at least 1960. Available Sanborn maps indicate that as early as 1893 the subject property was occupied by a brass foundry. In 1893 the brass foundry contained ovens and two stacks. Brass, which is primarily copper and zinc, can also at times contain aluminum or lead. As shown on the 1926 Sanborn map, the brass foundry had expanded significantly by that time and was owned by Lumen. The 1926 and 1950 Sanborn maps labeled the facility as "Mfrs Of Bronze, Brass & Aluminum Castings." The 1926 and 1950 Sanborn maps also indicate that the majority of the buildings were "fireproof" and a building labeled "reclaimed smelter" was located along the western property boundary along Lathrop Street. A historical photograph of the facility shows a tall smokestack associated with Lumen. The city directories reviewed indicate that the subject property was occupied by the Lumen brass founders from as early as 1930 to at least 1960. A variety of metal industry catalogues and industrial publications point to Lumen being present at the site as early as 1905. From 1970 until 1992, the subject property was occupied by furniture companies. In 2001, the City of Buffalo took possession of the property; in 2012 the former foundry buildings were demolished. When New York State Department of Environmental Conservation (NYSDEC) requested data from the demolition, the city indicated that no environmental data exists.

On April 1 and August 25, 2014, WESTON personnel visited 197 Lathrop Street in Buffalo, NY, the reported address of the former Lumen facility as indicated in the 2001 Eckel report, city directories, and on available Sanborn maps. The subject property is located in a primarily residential area. The historical address of the subject property on Lathrop Street is currently vacant. As stated above, the former foundry buildings were demolished by the City of Buffalo in 2012. The subject property currently consists of a vacant parcel with unrestricted access. The ground surface consists of bare soil and patches of grass; some remnants of the former facility are visible. Residential properties with grass-covered yards are adjacent to the southern boundary of the site. Additionally, residential properties are located west of the subject property across Lathrop Street. Residential properties and a commercial property are located north of the former foundry across Sycamore Street. Railroad tracks border the subject property along its eastern boundary; a park and playground are located on the east side of the railroad tracks.

Based on a review of historical aerial photographs, it appears that the area surrounding the former foundry was an even denser residential area than it is today. Sometime between 1995 and 2006, a large number of residential homes were removed, leaving areas of exposed soil. According to available wind rose plots, the prevailing wind direction in Buffalo is approximately southwest to northeast, indicating that some of the residential properties are downwind of the former foundry location. Observations made during the August 2014 site reconnaissance indicate a sufficient number of potential soil sampling locations within public ROWs in residential neighborhoods of varying age, upwind and downwind of the site, to evaluate if historical releases of lead have occurred. Potential soil sampling locations were also identified at a church and a public park situated upwind and downwind of the site, respectively.

Task 1405 – Lake Erie Smelting Corp. 29 Superior Street (historical), Buffalo, NY 14204

The Lake Erie Smelting Co. (LES) facility was operational as a secondary smelter from approximately 1935 to the early to mid-1960s. A review of available Sanborn maps indicates that, as of 1926, the property located at 29 Superior Street was partially occupied by a junkyard. By 1950, the subject property contained a building labeled “Scrap Metal Stge” and included a “melting pot.” Subsequent Sanborn maps (i.e., 1981 and 1986) indicate that the subject property and surrounding block had been subsumed by a large apartment complex. City directories reviewed for the subject property indicate that the property was occupied by Goldman Hyman junk in 1925, Goldman and Sons junk in 1930, Goldman and Sons smelters in 1935 and 1940, and Lake Erie Smelting in 1946 and 1950. The subject property was not identified in any subsequent city directories, beginning in 1955. Historical aerial photographs depict the facility in 1938 and 1959, yet by 1966 the subject property and entire surrounding area had been leveled. The next available aerial photograph (1978) shows the apartment buildings as they currently stand. Property information obtained from the City of Buffalo indicates that the apartment complex was constructed in 1972.

On April 1 and August 26, 2014, WESTON personnel visited the approximate location of 29 Superior Street in Buffalo, NY, the reported address of the former LES facility as indicated in the 2001 Eckel report and city directories. As confirmed during the April and August 2014 reconnaissance efforts, Superior Street no longer exists. The subject property and entire surrounding area have been redeveloped into a large housing complex, Towne Gardens, which

was constructed in 1972 and encompasses approximately 17 acres. The housing complex consists of numerous clusters of two-story housing units with grassy areas between housing units. A review of historical aerial photographs and Sanborn maps indicate that the former buildings were demolished between 1959 and 1966. Geographic correlation among the 1950 and subsequent Sanborn maps indicate that Buildings E-7 and D-8 were built on or in the immediate vicinity of the former smelter location. According to available wind rose plots, the prevailing wind direction in Buffalo is approximately southwest to northeast, indicating that not only was a portion of the housing complex constructed directly on top of the former location of the smelter, yet also downwind. Observations made during the August 2014 reconnaissance indicate a sufficient number of potential soil sampling locations within public ROWs in residential neighborhoods of varying age upwind and downwind of the site, to evaluate if historical releases of lead have occurred. A potential soil sampling location was also identified within a public park upwind of the site.

An Internet search for the Lake Erie Smelting Company indicates that a second facility is located at 127 Fillmore Avenue in Buffalo, NY, approximately 0.75 mile southeast of the facility formerly located at 29 Superior Street. The address is also listed to be occupied by Metalico Buffalo, Inc. It appears that the facility located at 127 Fillmore Avenue is an active scrap recycling facility; however, it is not known if this facility is indeed associated with the facility formerly located at 29 Superior Street.

Task 1406 – Niagara Falls Smelting & Refining - Div. of Continental Copper and Steel Industries, 2200-2208 Elmwood Avenue, Buffalo, NY 14216

The Niagara Falls Smelting & Refining - Div. of Continental Copper and Steel Industries (NFS) facility was operational as a possible smelter as early as 1925 to at least 1960. The 1916 Sanborn map indicates parcel boundaries yet no other features for the subject property, and the 1935 Sanborn map does not depict the subject property. The 1950 Sanborn map indicates that the Niagara Falls Smelting & Refining Div. of Continental Copper & Steel Industries Inc. occupied 2204–2208 Elmwood Avenue. The facility consisted of numerous buildings on several parcels located along Elmwood and Ramsdell Avenues; however, the building situated at 2206 is indicated to be a dwelling. The largest building associated with the former smelting facility, located along Ramsdell Avenue, contained “blower system smelting furnaces.” The western boundary of the former smelting facility is not fully depicted on the available Sanborn maps. According to a 1944 publication, NFS produced alloys used in hardening and tempering steel for military equipment.

On April 1 and August 25, 2014, WESTON personnel visited the approximate location of 2200–2208 Elmwood Avenue in Buffalo, NY, the reported address of the former NFS facility as indicated in the 2001 Eckel report, city directories, and on available Sanborn maps. The subject property is located in a mixed commercial, industrial, and residential area. The subject property currently consists of numerous commercial and light industrial businesses, such as a coffee shop, automobile repair shop, and metal and glass fabrication. The majority of the buildings used as part of the former smelting facility still exist today; some seem to have been renovated, while others do not. The largest on-site building, which appears to be the same building that historically contained the “smelting furnaces,” is currently an automobile storage garage. The

majority of the former facility footprint is covered by buildings or by an asphalt parking lot; however, some portions of the ground surface are gravel- and dirt-covered with some small patches of exposed soil. The approximate footprint of the former facility is bordered to the west by basketball courts and a baseball field. As can be seen on the historical aerial photographs from 1938, 1959, and 1966, this area was an open field and/or baseball field during the timeframe when NFS was operational. The City of Buffalo tax maps identify the baseball field as Ramsdell Playground.

The facility is bordered to the north, south, and east by other commercial and industrial facilities; however, a large residential area is located just beyond Elmwood Avenue (within 0.15 mile) to the north and east of the former smelter. Available Sanborn maps and aerial photographs indicate that development of the residential area occurred before or during the years that the facility was in operation. According to available wind rose plots, the prevailing wind direction in Buffalo is approximately southwest to northeast, indicating that the residential neighborhood is downwind of the former smelter location. Observations made during the August 2014 site reconnaissance indicate a sufficient number of potential soil sampling locations within public ROWs in residential neighborhoods, both upwind and downwind of the site, to evaluate if historical releases of lead have occurred. A potential soil sampling location was also identified in Ramsdell Playground, situated upwind of the site.

Task 1407 – Samuel Greenfield Co., 31 Stone Street, Buffalo, NY 14212

The Samuel Greenfield Co. (SGC) facility was operational as a secondary smelter from approximately 1939 to the mid-1960s. Available city directories listed “Samuel Greenfield Co. Inc. Smelter” at 31 Stone Street for the years 1940, 1955, 1960, and 1964. “Samuel Greenfield Co. Inc. Smelter” is also listed at 29 Stone Street in 1946, 1950, 1960, and 1964. The 1917 Sanborn map indicates that the subject property was occupied by “Kellogg Structural Steel Co.,” which is consistent with the listing for the subject property in city directories. The city directories for the years 1925 and 1930 listed Kellogg Structural Steel Co. at the subject property. The 1939 Sanborn map indicates that the subject property was occupied by “Samuel Greenfield Co. Inc. Scrap Metal and Refining”; melting pots” and “melting pots and furnace” were indicated to be present on the property. The 1939 Sanborn map also indicates that “dwellings” were located along Stone Street and Bailey Avenue bordering the facility property to the north, east, and west, including 37 Stone Street, which was surrounded by the facility property on three sides. A 1931 advertisement indicated that SGC was a metal dealer that dealt in scrap metals, including virgin copper, tin, lead, zinc, and aluminum, as well as brass, bronze, and aluminum ingots.

The 1950 Sanborn map indicates that the facility had expanded since 1939. The main building had been enlarged and contained numerous “melting pots” and “furnace vents.” Additional smaller structures were depicted on the subject property and indicated to be “fireproof construction.” Dwellings were still depicted along Stone Street and Bailey Avenue, bordering the subject property. However, 37 Stone Street no longer appeared to be a dwelling and seems to have been incorporated into the Samuel Greenfield property. The 1986 Sanborn map (i.e., the next available Sanborn Map after 1950) indicates that the former smelter buildings in the southern portion of the property adjacent to the railroad tracks had been demolished and the subject property was occupied by “Accubond Rebuilders Inc.” However, this seems to be

inconsistent with the aerial photographs for around this timeframe (1978, 1983, and 1995), which show that some of the former smelter buildings in this area (two long narrow buildings parallel to the railroad tracks) were present as they were in the 1938, 1959, and 1966 photographs. Due to the scale and quality of the aerial photographs, specific facility features such as chimneys and/or smokestacks, cannot be determined.

Information obtained from NYSDEC indicates that several oil spills were reported for this address in 1989, 1990, 1992, and 1996 when the property was owned by Cousins Core Inc. Additional information from NYSDEC indicates that the property was purchased in 2001 by a church for use as a burial site. However, upon beginning excavation, buried drums were encountered along the railroad tracks and a possible ash disposal area was observed. Additionally, strong petroleum and chemical odors were noted emanating from the excavated debris material as it was removed from the property.

On April 1 and August 26, 2014, WESTON personnel visited the location of 31 Stone Street in Buffalo, NY, the reported address of the former SGC facility as indicated in the 2001 Eckel report, city directories, and on available Sanborn maps. The subject property is located in a mixed industrial and residential area. The majority of the buildings may have been used as parts of the former smelting facility are still present on the property. The northern two-thirds of the property are covered by buildings or asphalt, with the remaining southern one-third consisting of grass-covered and exposed soil. The subject property is completely fenced; however, the fence line along the southern boundary adjacent to the railroad tracks appeared to be in poor condition. Graffiti is present on numerous facility buildings, indicating a history of trespassers on the property.

The facility is bordered to the north across Stone Street by a large commercial warehouse, to the east and west along Stone Street by residential properties, and to the south by railroad tracks beyond which is a large industrial property. A large residential area is located across the railroad tracks to the south. Another large residential area is located west and northwest of the former smelter across Bailey Avenue. A review of historical Sanborn maps and aerial photographs dated from 1938 to 1966 indicated that these residential areas were present during the timeframe when the smelter was operational. According to available wind rose plots, the prevailing wind direction in Buffalo is approximately southwest to northeast, indicating that the adjacent residential properties are predominately downwind of the former smelter location. Observations made during the August 2014 site reconnaissance indicate a sufficient number of potential soil sample locations within public ROWs in residential neighborhoods of varying age, both upwind and downwind of the site, to evaluate if historical releases of lead have occurred.

Task 1408 – Kornblum, Sidney, 394 Johnson Avenue, Brooklyn, NY 11206

The operational history of Kornblum, Sidney (a.k.a. Crescent Smelting Works, Kornblum Sidney Metals) as a smelter is documented. The 1940 city directory lists “Crescent Smelting Works” as the occupant. Crescent Smelting Works is listed in the aforementioned doctoral dissertation; it is located 0.3 mile from Kornblum, Sidney and is being investigated separately by EPA. Sanborn maps, city directories, and certificates of occupancy from 1944 through 1951 indicate that a lead

melting and/or smelting facility including Kornblum, Sidney operated at 394 Johnson Avenue in Brooklyn, NY.

The city directories reviewed list “Kornblum Sidney Metals” in 1945 and 1949. The 1951 Sanborn map indicates “lead melting” at the subject property. The 1951 Sanborn map also depicts apartments located on Ingraham Avenue, with backyards adjacent to the southern portion of the subject property. In addition, residential properties and apartments are depicted along Morgan Avenue to the east of the subject property. The 1954 aerial photograph suggests the presence of trees in the backyards of the apartments along Ingraham Avenue. Contrary to the Sanborn maps reviewed, which indicate a “tin smith” present at the subject property for the years 1965 through 2007, the city directories reviewed indicate commercial businesses (i.e., Guaranteed Roofing & Sheet Metal Co. Inc., J & J Bakery Distributors, and 3 & 3 Bakery Distributors) present from 1965 through 2005. The EDR Radius Map™ Report with GeoCheck® reviewed lists Kornblum, Sidney as a lead smelter; however, it appears that this listing is associated with the William P. Eckel doctoral dissertation.

On April 8 and August 14, 2014, WESTON and EPA personnel visited 394 Johnson Avenue, Brooklyn, NY, the address of the former Kornblum, Sidney facility as indicated in Eckel’s report, city directories, certificate of occupancy, and on the reviewed Sanborn maps. A concrete building was observed with no exposed soil at the subject property. There are backyards with exposed soil and trees at the apartment buildings immediately south of the subject property, as confirmed on current and historical aerial photographs. The nearest area of exposed soil surrounding a street-side tree was observed across the street from the subject property on Johnson Avenue along with other trees located on Morgan Street, Bogart Street, and Meserole Street. Gilbert Ramirez Park is located approximately 0.07–0.1 mile southwest of the site and has exposed soil. Satellite imagery available on GoogleMaps® shows other occurrences of exposed soil within 200 feet of the subject property (e.g., residential properties along Morgan Avenue, southeast of the subject property). There are limited instances of exposed soil on or within the vicinity of the subject property; however, they do exist and were likely present during the historical smelting operations.

Task 1409 – Pittsburgh White Metal, 284 Hamilton Avenue, Brooklyn, NY 11231

The operational history of Pittsburgh White Metal as a smelter is documented. Available Sanborn maps and city directories indicate that Pittsburgh White Metal operated from 1934 through 1950 at the corner of Hamilton and Huntington Avenues. The city directories reviewed for the subject property indicate “Pittsburgh White Metal Co.” at 284 Hamilton Avenue from 1934 through 1949; the 1934 listing includes: “type metal printers supplies.” The 1938 Sanborn map indicates “Pittsburgh White Metal Co. Inc.” at the corner of Hamilton and Huntington Avenues; this map shows three “auto controlled gas furnaces” in the southwestern portion of the facility and an office area in the eastern portion of the facility along Hamilton Avenue. Also visible on the 1938 Sanborn map are residential properties located to the south along West 9th Street and to the west along Henry Street. The 1950 Sanborn map indicates a white metal foundry at the subject property, although the building footprint had been reduced due to the addition of the Gowanus Parkway and westward shift of Hamilton Avenue; the aforementioned residential properties were still present. For the remaining years that Sanborn map coverage was

reviewed (1969 through 2007), the sporadic presence of “Chem Labs” is noted at the corner of Hamilton and Huntington Avenues.

On April 8 and August 14, 2014, WESTON and EPA personnel visited 284 Hamilton Avenue in Brooklyn, NY, being the address of the former Pittsburgh White Metal facility as indicated in Eckel’s report, in city directories, and on reviewed Sanborn maps. An iron fence surrounds the 284 Hamilton Avenue parcel. No exposed soil was observed along Hamilton or Huntington Avenues on or in the immediate vicinity of the subject property. Adjacent to the south and west side of the subject property, residential properties were observed along West 9th Street and Henry Street. Although personnel were unable to observe the exposed soil in backyards of these residences during the reconnaissance, satellite imagery available on GoogleMaps confirms the likely presence of soil. A vacant lot with exposed soil, historically having had residential dwellings, is located directly south of the site. In addition, exposed soil was observed on the south side of West 9th Street in front of a former day care facility and along the pedestrian paths of the New York City Housing Authority (NYCHA) Red Hook East housing development. Further south of the site is the NYCHA Red Hook East housing development with exposed soil and numerous non-permeable surface playgrounds. There are several residences with limited instances of exposed soil in the vicinity of the subject property. Exposed soil located within the ROW street trees along Nelson Street, West 9th Street, and Mill Street was observed.

Task 1410 – Empire Metal Co., 820 E. Water Street, Syracuse, NY 13210

According to Eckel, the “Empire Metal Co.” listing for 820 E. Water Street, Syracuse, NY was based on a Standard Metal Directory (SMD) entry from 1950. The address is Block 17, Lot 02.7 on a 2013 Onondaga County Tax Map for the City of Syracuse. Available Sanborn maps indicate that the subject property contained residential dwellings in 1892. A 1907 industry publication identified that the company had built a new, two-story smelting plant at the site. The article indicated that the new plant doubled the company’s output of Babbitt metals, solder, phosphor tin, and metallic flux for galvanizing. The 1910 Sanborn map depicted the “Empire Metal Co., Mfr of Babbitt Metal Etc.” occupying the addresses of 816, 818, and 820 E. Water Street. A building occupied approximately one-half of the eastern portion of the subject property and contained “melting furnaces.” Adjacent to the western boundary of the subject property was a foundry “M. L. Oberdorfer Brass Co.” and the “Onondaga Brass Co” approximately 300 feet northeast of the Site. Brass and aluminum furnaces and a brick chimney and possible vent stacks were depicted on the map along the southwestern portion of the foundry. The next available Sanborn map (dated 1951) indicates that the Empire Metal Co. occupied 820 E. Water Street at that time. The 816 E. Water Street address had become part of the adjacent Sheet Metal Works facility; otherwise, the Empire Metal Co. property remained as it was depicted on the 1910 Sanborn map and in the subsequent Sanborn maps dated 1953, 1961, 1968, and 1971.

The 1990 Sanborn map (i.e., the next available map after 1971) depicted the subject property and surrounding properties as occupied by a housing complex. The housing complex was a low-income apartment and townhome complex that was built in the 1970s and closed in 2008. Subsequently, the property was purchased by the State University of New York (SUNY) Upstate Medical University. The housing complex was demolished in 2013 and a 50,000-square-foot building known as Central NY Biotech Accelerator was constructed due south of the site. The

project is part of a 14-acre redevelopment project known as Loguen's Crossing that will consist of retail, commercial, and residential development.

Available city directories listed "Empire Metal Co. – metal mfrs" at 820 E. Water in 1938. In 1944, Empire Metal Co. was again listed at 820 E. Water Street. In 1949, several companies were listed at 820 E. Water Street, including: Empire Metal Co., Allen Bradley Co. – electrical machinery mfrs, and Walsh James Co. – food brokers. In 1954, Empire Metal Co. and Allen Bradley Co. were listed at 820 E. Water Street. The occupants of the 820 E. Water Street remained similar for the years 1959, 1964, and 1968. In the city directory listings for 1978, 1983, and 1988, the only listings for the 800 block of E. Water Street were the Kennedy Apartments at 830, 850, and 890 E. Water Street, as well as listings for some individuals. The 1993 city directory listed Kennedy Apartments and Syracuse Hill Apartments along the 800 block of E. Water Street. In 1999, 2003, 2008, and 2013, numerous individuals were listed for the addresses along the 800 block of E. Water Street.

Information obtained from NYSDEC indicates that, in 1999, NYSDEC was notified of a petroleum odor at one soil boring location at a depth of approximately 6–8 feet below ground surface. The spill identification number/file was closed in January 2010. No further information, particularly with respect to analytical data of the soil boring samples, was provided.

On April 2 and August 27, 2014 WESTON personnel visited the approximate location of 820 E. Water Street in Syracuse, NY, the reported address of the former Empire Metal Co. facility as indicated in the 2001 Eckel report, city directories, and on available Sanborn maps. The subject property is located in a primarily commercial and industrial area. The subject property is currently vacant; the western portion is being used as a parking area for the adjacent commercial property. An aerial photograph of the subject property dated 2011, shows a portion of the housing complex present on the property; however, WESTON observed that the housing complex had since been demolished. Exposed soil and demolition debris were observed on the former apartment complex property, which were enclosed within a fence. The portion of the subject property being used as a parking area was covered with asphalt; however, exposed soil was observed along the fence line and the ROW.

The subject property is bordered to the north by E. Water Street, a medical office and associated parking lot; to the east by vacant property, which formerly contained a recently demolished housing complex; and to the south and west by commercial properties. WESTON did not observe any residences, schools, or day care centers in the immediate vicinity of the subject property; however exposed soil is located in the vicinity of the site. According to available wind rose plots, the prevailing wind direction in Syracuse is approximately west to east, indicating that exposed soil and a park are downwind of the former facility location.

Task 1411 – Columbia Smelting & Refining Works, 98 Lorraine Street, Brooklyn, NY 11231

The operational history of the Columbia Smelting & Refining Works (Columbia Smelting) as a smelter is documented. A 1931 advertisement for Columbia Smelting & Refining Works, Inc., 98-106 Lorraine St., indicated that the company manufactured soft lead, antimonial lead, Babbitts, solder, and several other metal products. The advertisement also listed items consumed

by the company, including cable lead, battery plates, and soft lead. The 1938 Sanborn map indicates the presence of “Columbia Smelting & Refining Works Inc., refinery & furnaces” at the subject property. The 1938 Sanborn map also depicts the Red Hook Houses federal housing development, “built 1938”, located across Lorraine Street and north of the subject property. Red Hook Houses is the largest public housing development in Brooklyn, covering a large area from west-northwest to east-northeast of the subject property. The next available Sanborn map (1950) shows that the buildings on the subject property had been demolished and the property had been incorporated into a playground, which extends from Lorraine Street to Bay Street and Hicks Street to Henry Street and covers over that section of Creamer Street. The subject property is shown as vacant on available historical aerial photographs dated 1924 and 1940, which pre- and post-date the documented years of operation (i.e., 1931–1938). The 1943 aerial photograph depicts four baseball fields (still present today) at the aforementioned playground area; the footprint of the former smelter is located within the baseball field located at the corner of Hicks and Lorraine Streets. Based on a review of aerial photographs, it appears that the subject property and the remainder of the block where it's located have been utilized as baseball fields since the early 1940s.

On February 28, March 15, and March 20, 2012, the City of New York Department of Parks and Recreation (NYC DPR) collected soil samples from the baseball fields and surrounding grassy areas. Soil samples collected on February 28 and March 15, 2012 were analyzed for lead only; sample results indicated the presence of lead ranging between 119 milligrams per kilogram (mg/kg) and 2,630 mg/kg. Between February 28 and March 15, 2012, NYC DPR added 1 inch of soil to each infield area. The March 20th soil sample was analyzed for volatile organic compounds (VOC), semivolatile organic compounds (SVOC), polychlorinated biphenyls (PCB), and total metals (including mercury). There were no detections of VOCs or PCBs. There were several detections of SVOCs, primarily polyaromatic hydrocarbons (PAH). Analytical results of lead and mercury were 812 mg/kg and 0.63 mg/kg, respectively. The baseball fields were subsequently closed for 6-8 weeks for remediation by DPR.

On April 8 and August 14, 2014, WESTON and EPA personnel visited 98 Lorraine Street in Brooklyn, NY, being the address of the former Columbia Smelting & Refining Works facility as indicated in Eckel's report and on reviewed Sanborn maps. A baseball field (one of four baseball fields located on the aforementioned playground area) was observed on the former location of the subject property. During the August 2014 reconnaissance performed by WESTON, the baseball fields were not closed off to the public and children and adults were seen on the baseball park property. There is currently exposed historical soil nearby in all directions from the former location of the Columbia Smelting facility; however, some of these areas are limited to street trees in ROWs, particularly to the west. An expansive apartment complex with exposed historical soil and a playground, NYCHA's Red Hook East, is located directly north of the site; the apartment complex and playground may have been present for approximately 2 years (possibly 1938-1939) while Columbia Smelting was in operation. Historical exposed soil was observed south of the site within Red Hook Park and along rights-of-way on Hicks Street, Henry Street, and Bay Street, where street-side trees are currently located.

PROJECT DESCRIPTION

In order to characterize on-site soils and potential releases, Region 2 SAT has been tasked with the collection of soil samples (including duplicate samples and other QC samples as needed) in support of the PA/SI evaluations of the sites. The soil samples will be collected from sample locations that include exposed soil near the footprint of the former smelter facilities, exposed soil in downwind directions, and exposed soil considered to be upwind that were observed during August 2014 reconnaissance activities in the site vicinities. The proposed sample locations include private and public locations, primarily ROWs, public parks, church properties, and residential properties. Soil will be obtained with hand augers or subsurface manual soil probes. Samples will be analyzed by an off-site laboratory for TAL Metals and Tin (excluding Hg and CN⁻). The field sampling effort is tentatively scheduled to begin in October 2014.

See Appendices A through K for site-specific tables and figures, including Proposed Sample Location Maps. [Note for Tasks 1401, 1402, 1403, and 1407: Figure 2A and Table 2A showing alternate sample locations are provided in case there are any issues with site access or accessibility at specific sampling locations associated with these sites. These locations would only be used to replace samples that cannot be collected.]

QAPP Worksheet #10: Problem Definition (Concluded)

OBSERVATION FROM ANY SITE RECONNAISSANCE REPORT

See the site descriptions above. Possible soil sample locations were recorded with a Global Positioning System (GPS) instrument during reconnaissance activities conducted in August 2014 and transferred to Proposed Sample Location Maps using geographic information systems (GIS) technology.

PROJECT DECISION STATEMENTS

EPA will use the analytical data from this investigation to evaluate impacts of operations at the former smelters on soils near the footprint of the former buildings and in surrounding neighborhoods.

QAPP Worksheet #11: Project Quality Objectives/Systematic Planning Process Statement

Overall project objectives include: Sampling will be conducted by Region 2 SAT to determine if the soil on the sites and in surrounding neighborhoods contains elevated concentrations of lead and other metals.

Who will use the data? Data will be used by EPA Region 2 Pre-Remedial Section (PRS) and Removal Action Branch (RAB).

What will the data be used for? The analytical data from this investigation will be used to assist EPA in determining whether soil at the sites contains elevated concentrations of lead and other metals requiring further action or assessment.

What types of data are needed?

Matrix:	Soil samples
Type of Data:	Definitive data for soil samples
Analytical Techniques:	Off-site laboratory analyses
Parameters:	TAL Metals and Tin (excluding Hg CN)
Type of sampling equipment:	Hand augers, plastic scoops, aluminum trays, and sample jars
Access Agreement:	Region 2 SAT and EPA Region 2 will obtain access to all sampling locations prior to sampling.
Sampling locations:	Soil samples will be collected from exposed soil or grass-covered areas near the footprint of the former smelter locations; from the exposed soil or grass-covered areas at nearby parks, cemeteries, churches, and residences; and from exposed soil or grass-covered areas in ROWs at the sites and in surrounding neighborhoods.

How much data are needed? For each former smelter site investigation, 64 to 74 soil samples (including 4 field duplicate samples) are anticipated to be collected from 12 to 14 sample locations, each of which will be comprised of 5 discrete depth samples. At each site, approximately four of the sample locations will be from properties believed to be upwind of the site; samples collected from these locations will be considered background. The samples collected will be submitted for laboratory analysis.

How “good” does the data need to be in order to support the environmental decision?

Sampling/analytical measurement performance criteria for precision, accuracy, representativeness, completeness, and comparability (PARCC) parameters will be established. Refer to Worksheet #12, criteria for performance measurement for definitive data.

Where, when, and how should the data be collected/generated? The soil sample locations are shown on the maps presented in Appendices A through K. The soil samples to be collected from the sites have been discussed with EPA. The sampling event is tentatively scheduled to begin in October 2014. All samples will be collected using methods outlined in the standard operating procedures (SOP).

**QAPP Worksheet #11: Project Quality Objectives/Systematic Planning Process Statement
(Concluded)**

Who will collect and generate the data? The soil samples will be collected by WESTON Region 2 SAT. Samples will be analyzed and validated by the EPA Region 2 Laboratory.

How will the data be reported? After completion of the sampling activities at each site, WESTON Region 2 SAT will provide a Sampling Trip Report (STR) with Sample Location Map to EPA. All data will be reported to the EPA ERRD-SPB-PRS and WESTON Region 2 SAT by the Region 2 Laboratory via the Hazardous Waste Support Section (HWSS) Quickr website. DESA-HWSB-SST will verify that the Region 2 Laboratory delivers the electronic data deliverables (EDD) to HWSS for uploading to the Quickr website. WESTON will report the analytical results for each site in separate PA/SI Reports to be submitted to the EPA TOCOR Designee.

How will the data be archived? Electronic deliverables and data files will be compiled and delivered to EPA on compact disc.

QAPP Worksheet #12: Measurement Performance Criteria Table

Complete this worksheet for each matrix, analytical group, and concentration level. Identify the data quality indicators (DQI), measurement performance criteria (MPC) and QC sample and/or activity used to assess the measurement performance for both the sampling and analytical measurement systems. Use additional worksheets if necessary. If MPC for specific DQI vary within an analytical parameter, i.e., MPC are analyte-specific, then provide analyte-specific MPC on an additional worksheet.

Matrix	Soil / Aqueous				
Analytical Group	TAL Metals & Tin (excluding Hg and CN ⁻)				
Concentration Level	Low/Medium				
Sampling Procedure¹	Analytical Method/SOP²	Data Quality Indicators (DQI)	Measurement Performance Criteria	QC Sample and/or Activity Used to Assess Measurement Performance	QC Sample Assesses Error for Sampling (S), Analytical (A) or both (S&A)
SOP # 2001 SOP # 2012	EPA Method 200.7 / SOP C-109	Precision	% RPD < 20(Aq), % RPD <25(Soil)	LCS Duplicate	A
		Accuracy	Limits: Average Recovery ± 20% aqueous, ± 25% Soil)	LCS	A
		Accuracy	± 20% aqueous, ± 25% Soil)	Matrix spike	A
		Precision	< RL	Interference Check Sample (ICP-AES)	A
		Accuracy	< RL	Method Blank	A
		Precision	RPD < 20 %	Serial Dilution Test (ICP-AES)	A

¹ Reference number from QAPP Worksheet #21.

² Reference number from QAPP Worksheet #23. Aqueous samples will consist of rinsate blanks only. Aqueous field duplicate and MS/MSD samples will not be collected.

QAPP Worksheet #13: Secondary Data Criteria and Limitations Table

Any data needed for project implementation or decision making that are obtained from non-direct measurement sources such as computer databases, background information, technologies and methods, environmental indicator data, publications, photographs, topographical maps, literature files and historical data bases will be compared to the DQOs for the project to determine the acceptability of the data. Thus, for example, analytical data from historical surveys will be evaluated to determine whether they satisfy the validation criteria for the project and to determine whether sufficient data was provided to allow an appropriate validation to be done. If not, then a decision to conduct additional sampling for the site may be necessary.

Secondary Data	Data Source (Originating Organization, Report Title, and Date)	Data Generator(s) (Originating Org., Data Types, Data Generation/ Collection Dates)	How Data May Be Used (if deemed usable during data assessment stage)	Limitations on Data Use
Background Information	various sources, titles, and dates	various	To document site features, condition, and history.	Qualitative use only
EPA Soil Investigations	Soil sampling events (WESTON Region 2 SAT, PA/SI Reports, dates TBD).	WESTON Region 2 SAT	To determine the impact of lead and other metals near the former smelter footprints and the surrounding neighborhoods.	Possible interference from other contaminant sources

QAPP Worksheet #14: Summary of Project Tasks

Sampling Tasks:

As part of the Combined PA/SI, Region 2 SAT is tasked with the collection of 64 to 74 grab soil samples per site, including QA/QC samples, from the former smelter locations and surrounding neighborhoods. Sampling will tentatively begin in October 2014. The samples will be collected to determine the concentrations of lead and other metals in soils. The soil samples will be collected from test borings located in exposed soil and grass-covered areas near the former smelter footprints and in downwind and upwind directions based on prevailing wind direction. The soil samples will be collected at the intervals of 0-1, 1-6, 6-12, 12-18, and 18-24 inches bgs. The soil samples collected will be submitted to the EPA Region 2 Laboratory for TAL Metals and Tin analysis (excluding Hg and CN⁻). The soil samples will be collected for a definitive data QA objective. Field duplicate and MS/MSD samples will be collected at a rate of one per twenty soil samples. Soil samples collected from the 0-1 inch interval will be designated for sieving with a 250-micron stainless steel sieve and pan. Organic debris will be removed from the sample before it is homogenized. Soil samples will be collected in 4-oz. jars.

Analysis Tasks:

Soil, Rinsate Blanks: TAL Metals and Tin analysis (excluding Hg and CN⁻) – Region 2 Laboratory SOP # C-109 (Ref. EPA Method 200.7)

Quality Control Tasks:

The soil samples will be collected for definitive data QA objective. Field duplicate and MS/MSD samples will be collected at a rate of one per twenty soil samples or one per batch of less than twenty samples. One rinsate blank per site will be collected to ensure adequate decontamination of non-dedicated sampling equipment.

Data Management Tasks:

Activities under this project will be reported in status and trip reports and other deliverables (e.g., analytical reports, final reports) described herein. Activities will also be summarized in appropriate format for inclusion in monthly and annual reports.

The following deliverables will be provided under this project:

Sampling Trip Reports: A sampling trip report will be prepared for each site to provide a detailed accounting of what occurred during each sampling mobilization. The sampling trip reports will be prepared within two weeks of the last day of each sampling mobilization. Information will be provided on time of major events, dates, and personnel on-site (including affiliations). Submittal dates to be determined.

QAPP Worksheet #14: Summary of Project Tasks (Continued)

Maps/Figures: Maps depicting site layouts and sample locations will be included in the sampling trip reports, as appropriate.

Preliminary Assessment/Site Inspection (PA/SI) Report: A PA/SI report will be prepared for each site with samples analyzed under this plan. WESTON Region 2 SAT will provide each report to the EPA PRS within 60 days after receiving validated data. A PA/SI can be used to determine if on-site waste sources are present and if nearby targets are potentially exposed to site-related contamination.

Documentation and Records:

All sample documents will be completed legibly, in ink. Any corrections or revisions will be made by lining through the incorrect entry and by initialing the error.

Field Logbook: The field logbook is essentially a descriptive notebook detailing site activities and observations so that an accurate account of field procedures can be reconstructed in the writer's absence. Field logbook will be bound and paginated. All entries will be dated and signed by the individuals making the entries, and should include (at a minimum) the following

1. Site name and project number
2. Name(s) of personnel on-site
3. Dates and times of all entries (military time preferred)
4. Descriptions of all site activities, site entry and exit times
5. Noteworthy events and discussions
6. Weather conditions
7. Site observations
8. Sample and sample location identification and description *
9. Subcontractor information and names of on-site personnel
10. Date and time of sample collections, along with COC information
11. Record of photographs
12. Site sketches

* The description of the sample location will be noted in such a manner as to allow the reader to reproduce the location in the field at a later date.

Sample Labels: Sample labels will clearly identify the particular sample, and should include the following:

1. Site/project number.
2. Sample identification number.
3. Sample collection date and time.
4. Designation of sample (grab or composite).
5. Sample preservation.
6. Analytical parameters.
7. Name of sampler.

QAPP Worksheet #14: Summary of Project Tasks (Concluded)

Sample labels will be written in indelible ink and securely affixed to the sample container. Tie-on labels can be used if properly secured.

Custody Seals: Custody seals demonstrate that a sample container has not been tampered with or opened. The individual in possession of the sample(s) will sign and date the seal, affixing it in such a manner that the container cannot be opened without breaking the seal. The name of this individual, along with a description of the sample packaging, will be noted in the field logbook.

Assessment/Audit Tasks: No performance audit of field operations is anticipated at this time. If conducted, performance and system audit will be in accordance with the project plan.

Data Review Tasks: All data will be validated by EPA Region 2 Laboratory data validators. Laboratory analytical results will be assessed by the data reviewer for compliance with required precision, accuracy, completeness, representativeness, and sensitivity.

QAPP Worksheet #15: Reference Limits and Evaluation Table

Analyte	CAS Number	EPA RMLs (mg/kg) *		CRQLs, ICP-AES Soil (mg/kg) **	Achievable Region 2 Laboratory Levels (mg/kg)	
		Residential Soil	Industrial Soil		MDLs	RLs
Antimony	7440-36-0	94	1,400	6	0.22	2
Arsenic	7440-38-2	67	300	1	0.35	0.8
Barium	7440-39-3	46,000	650,000	20	0.24	10
Beryllium	7440-41-7	470	6,900	0.5	0.02	0.3
Cadmium	7440-43-9	210	3,000	0.5	0.02	0.3
Chromium	7440-47-3	350,000	5,300,000	1	0.34	0.5
Cobalt	7440-48-4	70	1,000	5	0.03	2
Copper	7440-50-8	9,400	140,000	2.5	0.26	1
Lead	7439-92-1	400	800	1	0.23	0.8
Manganese	7439-96-5	5,500	77,000	1.5	0.33	0.5
Nickel	7440-02-0	4,600	67,000	4	0.09	2
Selenium	7782-49-2	1,200	18,000	3.5	0.22	2
Silver	7440-22-4	1,200	18,000	1	0.06	0.5
Thallium	7440-28-0	2.3	35	2.5	3.14	2
Tin	7440-31-5	140,000	2,100,000	NS	NS	1
Vanadium	7440-62-2	1,200	17,000	5	0.40	2
Zinc	7440-66-6	70,000	1,100,000	6	1.57	2

CAS – Chemical Abstract System

ICP-AES – Inductively Coupled Plasma-Atomic Emission Spectroscopy

CRQL – Contract Required Quantitation Limit

MDL – Method Detection Limit

NS – not specified

RL – Reporting Limit

RML – Removal Management Level

* EPA Region 4: Superfund. Regional RMLs for Chemicals, Generic RML Tables, June 2014. Available at

<http://www.epa.gov/region4/superfund/programs/riskassess/rml/rml.html>. Downloaded September 2014.

** CRQLs are included for comparison with achievable RLs. Source: EPA Contract Laboratory Program. ISM01.3 Metals and Cyanide Target Analyte List and Corresponding CRQLs. Available at <http://www.epa.gov/superfund/programs/clp/target.htm>. Downloaded September 2014.

QAPP Worksheet #16: Project Schedule/Timeline Table

Activities	Organization	Dates (MM/DD/YY)		Deliverable	Deliverable Due Date
		Anticipated Date(s) of Initiation	Anticipated Date of Completion		
Preparation of QAPP	WESTON Region 2 SAT	08/18/2014	09/24/2014	QAPP	09/26/2014
Review of QAPP	EPA Region 2 COR and QAO	09/26/2014	Prior to sampling date	Approved QAPP	TBD
Preparation of HASP	WESTON Region 2 SAT	Prior to sampling date	TBD	HASP	TBD
Procurement of Field Equipment	WESTON Region 2 SAT	Prior to sampling date	TBD	NA	NA
Laboratory Request	WESTON Region 2 SAT	Prior to sampling date	TBD	Analytical Services Request Forms	09/26/2014
Field Reconnaissance/Access	WESTON Region 2 SAT; EPA Region 2 COR and OSCs	August 2014	August 2014	NA	NA
Collection of Field Samples	WESTON Region 2 SAT	TBD	TBD	NA	NA
Sampling Trip Report	WESTON Region 2 SAT	TBD	TBD	Sampling Trip Report	TBD
Laboratory Package and Electronic Data Received	EPA Region 2 Laboratory	60 days from last sample receipt date per site	TBD	--	--
Validation of Laboratory Results	EPA Region 2 Laboratory	With analytical results	TBD	Validation Report	TBD
Data Evaluation/ Preparation of PA/SI Reports	WESTON Region 2 SAT	TBD	TBD	PA/SI Report	TBD

TBD – To be determined

QAPP Worksheet #17: Sampling Design and Rationale

As part of the Combined PA/SI, Region 2 SAT is tasked with the collection of 64 to 74 grab soil samples per site, including QA/QC samples, from the former smelter locations and surrounding neighborhoods. The samples will be collected to determine the concentrations of lead and other metals in soils. The soil samples will be collected from test borings located in exposed soil and grass-covered areas near the former smelter footprints and in downwind and upwind directions based on prevailing wind direction. The soil samples will be collected at the intervals of 0-1, 1-6, 6-12, 12-18, and 18-24 inches bgs. Sampling will tentatively begin in October 2014.

Soil sampling will be conducted per EPA Environmental Response Team (ERT) SOP #2001 for General Field Sampling Guidelines and SOP #2012 for Soil Sampling. Soil samples will be collected in 4-oz. jars. Organic debris will be removed from the sample before it is homogenized. Soil samples collected from the 0-1 inch interval will be designated for sieving with a 250-micron stainless steel sieve and pan.

All non-dedicated equipment used during field-sampling activities will be decontaminated in accordance with EPA-ERT SOP #2006 prior to and subsequent to sampling. Decontamination of sampling equipment will be conducted as follows:

1. Alconox detergent and tap water scrub to remove visual contamination,
2. Generous tap water rinse,
3. Distilled/deionized water rinse,
4. 10% nitric acid rinse, and
5. Distilled/deionized water rinse.
6. Wrap with aluminum foil (shiny side out) for transport and handling, as necessary.

Decontamination will be carried out over a container for temporary collection of spent fluids. The spent decontamination fluids will then be neutralized with baking soda to pH of approximately 7 and discharged at the sample locations such that it is not permitted to migrate off-site.

The samples will be collected for a definitive data QA objective. Field duplicate and MS/MSD samples will be collected at a rate of one per twenty soil samples. See Worksheets #14 and #20 for a description of QA/QC samples. The soil and QA/QC samples will be submitted to the EPA Region 2 Laboratory for TAL Metals and Tin analysis (excluding Hg and CN⁻), as follows:

Lab Name/Location	Sample Type	Parameters
EPA Region 2 Laboratory 2890 Woodbridge Ave. Bldg. 209, MS-230 Edison, NJ 08837	Soil Samples and Aqueous Rinsate Blanks	TAL Metals & Tin (excluding Hg and CN ⁻)

QAPP Worksheet #18: Sampling Locations and Methods/SOP Requirements Table

Matrix	Sampling Location(s)	Units	Analytical Group(s)	Concentration Level	No. of Samples (identify field duplicates)	Sampling SOP Reference	Rationale for Sampling Location
Soil	See Proposed Sample Location Maps in Attachments A through K	mg/kg	TAL Metals & Tin (excluding Hg and CN ⁻)	ICP-AES: Low	See Attachments A through K	ERT SOP# 2001, 2006 and 2012	Determine contaminants, evaluate potential impacts from former smelters

Note: The website for EPA-ERT SOPs is: <http://www.ert.org/mainContent.asp?section=Products&subsection=List>

QAPP Worksheet #19: Analytical SOP Requirements Table

Matrix	No. of Samples	Analytical Group [Lab Assignment]	Concentration Level	Analytical and Preparation Method/SOP Reference	Sample Volume	Containers (number, size, and type)	Preservation Requirements	Maximum Holding Time (preparation/analysis)
Soil	See Summary of Analytical Services tables in Attachments A through K	TAL Metals & Tin (excluding Hg and CN)	Low	EPA Method 200.7 / SOP C-109	1 x 125 mL 1 x 125 mL (QC)	One 4-oz. glass jar	Cool to 4°C	6 months

QAPP Worksheet #20: Field Quality Control Sample Summary Table

Matrix	Analytical Group	Concentration Level	Analytical and Preparation SOP Reference	No. of Sampling Locations	No. of Field Duplicate Pairs	No. of Extra Volume Laboratory QC (e.g., MS/MSD) Samples	No. of Rinsate Blanks¹	No. of Trip. Blanks	No. of PE Samples
Soil	TAL Metals & Tin (excluding Hg and CN ⁻)	Low/Medium	C-109 (Ref: EPA 200.7)	See Summary of Analytical Services tables in Attachments A through K	1 per 20 samples, or 1 per batch of less than 20 samples	1 per 20 samples, or 1 per batch of less than 20 samples	1 per site	NR	NR

¹ Only required if non-dedicated sampling equipment is used.

NR – not required

TAL – target analyte list

QAPP Worksheet #21: Project Sampling SOP References Table

Reference Number	Title, Revision Date and/or Number	Originating Organization	Equipment Type	Modified for Project Work? (Y/N)	Comments
<u>SOP#2001</u>	General Field Sampling Guidelines (all media); Rev. 0.0 August 1994	EPA/OSWER/ERT	Bucket augers, plastic scoops, aluminum trays, and 4-oz. glass sample jars	N	--
<u>SOP#2006</u>	Sampling Equipment Decontamination; Rev 0.0 August 1994	EPA/OSWER/ERT	Bucket augers	N	--
<u>SOP #2012</u>	Soil Sampling from the Compendium of ERT Soil Sampling and Surface Geophysics Procedures.	EPA/OSWER/ERT	Bucket augers, plastic scoops, aluminum trays, and 4-oz. glass sample jars	N	--

Note: The website for EPA-ERT SOPs is: www.ert.org/mainContent.asp?section=Products&subsection=List

QAPP Worksheet #22: Field Equipment Calibration, Maintenance, Testing, and Inspection Table

Field Equipment	Calibration Activity	Maintenance Activity	Testing/ Inspection Activity	Frequency	Acceptance Criteria	Corrective Action	Responsible Person	SOP Reference
Personal Data Ram PDR-1000	Calibration annually by manufacturer	9-volt alkaline battery or rechargeable battery	Calibration performed by manufacturer	Annual	N/A	Replace battery or replace unit	Equipment vendor	N/A
MultiRAE Plus PID (Samuel Greenfield Co. site only)	Calibrate with Zero air; span gas of 100 ppm Isobutylene	Check/ replace battery/ Clean tip or bulb if necessary	Bump Test	Prior to day's activities; anytime anomaly suspected	+/- 5 units	Replace battery, or Replace Unit	Equipment Vendor	Manufacturer's Instructions
Trimble® GeoXT™ handheld	N/A	Recharge daily	N/A	Prior to event and each night during event	Per mfr.'s instructions	Replace battery if charge doesn't hold	Region 2 SAT sampling team members	Manufacturer's Instructions

QAPP Worksheet #23: Analytical SOP References Table

Reference Number	Title, Revision Date, and/or Number	Definitive or Screening Data	Analytical Group	Instrument	Organization Performing Analysis	Modified for Project Work? (Y/N)
C-109	Determination of Metals in Aqueous, TCLP Extract, Soil/Sediment, Sludge, and Biological Tissue Samples by ICP-AES (Ref. EPA 200.7) [Rev. 3.2, 8/31/2012]	Definitive	TAL Metals & Tin (excluding Hg and CN)	ICP-AES	EPA Region 2 Laboratory	N

EPA – U.S. Environmental Protection Agency

ICP-AES – Inductively coupled plasma – atomic emission spectroscopy

QAPP Worksheet #24: Analytical Instrument Calibration Table

Instrument	Calibration Procedure	Frequency of Calibration	Acceptance Criteria	Corrective Action	Person Responsible for Corrective Action	SOP Reference¹
ICP-AES	See SOP C-109	Initial calibration: daily or once every 24 hours and each time the instrument is set up. Continuing calibration: beginning and end of run, and frequency of 10% or every 2 hours during an analysis run.	Per instrument manufacturer's recommended procedures, with at least 2 standards.	Inspect the system, correct problem, re-calibrate, reanalyze samples.	Assigned EPA Region 2 Laboratory personnel	EPA Region 2 Laboratory SOP C-109

¹ See the Analytical SOP References table (Worksheet #23).

EPA – U.S. Environmental Protection Agency

ICP-AES – inductively coupled plasma atomic emission spectroscopy

SOP – standard operating procedure

QAPP Worksheet #25: Analytical Instrument and Equipment Maintenance, Testing, and Inspection Table

Instrument/ Equipment	Maintenance Activity	Testing/Inspection Activity	Frequency	Acceptance Criteria	Corrective Action	Responsible Person	SOP Reference¹
ICP-AES	Per instrument manufacturer's recommendations	Per instrument manufacturer's recommendations; check connections	Per instrument manufacturer's recommendations	Acceptable re- calibration; see EPA Region 2 Laboratory SOP C-109	Inspect the system, correct problem, re- calibrate and/or reanalyze samples.	EPA Region 2 Laboratory ICP- AES Technician	EPA Region 2 Laboratory SOP C-109

¹ See the Analytical SOP References table (Worksheet #23).

QAPP Worksheet #26: Sample Handling System

SAMPLE COLLECTION, PACKAGING, AND SHIPMENT
Sample Collection (Personnel/Organization): Site Manager and sampling team, Region 2 SAT
Sample Packaging (Personnel/Organization): Site Manager and sampling team, Region 2 SAT
Coordination of Shipment (Personnel/Organization): Site Manager and sampling team, Region 2 SAT
Type of Shipment/Carrier: FedEx or hand-delivery
SAMPLE RECEIPT AND ANALYSIS
Sample Receipt (Personnel/Organization): Sample Custodian, OSCAR/Region 2 Laboratory
Sample Custody and Storage (Personnel/Organization): Sample Custodian, OSCAR/Region 2 Laboratory
Sample Preparation (Personnel/Organization): Lab Technician, Region 2 Laboratory
Sample Determinative Analysis (Personnel/Organization): Lab Analyst, Region 2 Laboratory
SAMPLE ARCHIVING
Field Sample Storage (No. of days from sample collection): Samples to be shipped same day of collection, and arrive at laboratory within 24 hours (1 day) of sample shipment
Sample Extract/Digestate Storage (No. of days from extraction/digestion): Per analytical methodology; see Worksheet #19
SAMPLE DISPOSAL
Personnel/Organization: Sample Custodian, OSCAR/Region 2 Laboratory
Number of Days from Analysis: Until analysis and QA/QC checks are completed; Per analytical methodology; see Worksheet #19.

QAPP Worksheet #27: Sample Custody Requirements

Sample Identification Procedures: Each sample collected by Region 2 SAT will be designated by a code that will identify the site. The code will be a site-specific task number. The media type will follow the numeric code. A hyphen will separate the site code and media type. Specific media types are as follows: S – Soil Sample; RIN – Rinsate Blank

For soil samples, the media type (S) will be followed by the appropriate location number and the depth interval in inches, with hyphens as separators. Duplicate samples will be identified in the same manner as other samples and will be distinguished and documented in the field logbook. For rinsate blanks, the media code RIN will be followed by a sample number.

e.g. 1401-S01-0612 [Site ID (1401-), Soil Sample Number (S01-), Depth (6 to 12 inches)]
1401-RIN01 [Site ID (1401-), Rinsate Blank Number (RIN01)]

Field Sample Custody Procedures (sample collection, packaging, shipment, and delivery to laboratory): Each sample will be individually identified and labeled after collection, then sealed with custody seals and enclosed in a plastic cooler. The sample information will be recorded on chain-of custody (COC) forms, and will be either hand delivered or shipped to the appropriate laboratory via overnight delivery service or courier. COC records must be prepared in Scribe to accompany samples from the time of collection and throughout the shipping process. The sampling team will sign and date the COC record, which will be considered complete upon receipt at the laboratory. Every transfer of custody must be noted and signed for, and the sampling team will keep copies of all COCs. The COC record will be maintained from the time the sample is collected to its final deposition. When samples are not under direct control of the individual responsible for them, they must be stored in a locked container sealed with a custody seal. The COC record should include (at minimum) the following: 1) Sample identification number; 2) Sample information; 3) Sample location; 4) Sample date; 5) Sample time; 6) Sample type/matrix; 7) Sample container type; 8) Sample analysis requested; 9) Name(s) and signature(s) of sampler(s); and 10) Signature(s) of any individual(s) with custody of samples. When samples are not under direct control of the individual responsible for them, they must be stored in a locked container sealed with a custody seal.

For these events each shipping container will have its own COC record. A separate COC form must accompany each cooler for each daily shipment. The COC form must address all samples in that cooler, but not address samples in any other cooler. This practice maintains the COC for all samples in case of mis-shipment.

Laboratory Sample Custody Procedures (receipt of samples, archiving, and disposal): A sample custodian at the laboratory will accept custody of the shipped samples, and check them for discrepancies, proper preservation, integrity, etc. If noted, issues will be forwarded to the laboratory manager for corrective action. The sample custodian will relinquish custody to the appropriate department for analysis. Disposal of the samples will occur only after analyses and QA/QC checks are completed.

QAPP Worksheet #28: QC Samples Table

(UFP-QAPP Manual Section 3.4)

Complete a separate worksheet for each sampling technique, analytical method/SOP, matrix, analytical group, and concentration level. If method/SOP QC acceptance limit exceed the measurement performance criteria, the data obtained may be unusable for making project decisions.

Matrix	Soil / Aqueous ¹					
Analytical Group	TAL Metals & Tin (excluding Hg and CN)					
Concentration Level	Low/Medium					
Sampling SOP	2001, 2012					
Analytical Method/ SOP Reference	EPA Method 200.7 / SOP C-109					
Sampler's Name	Scott Snyder/Denise Breen/TBD					
Field Sampling Organization	WESTON Region 2 SAT					
Analytical Organization	EPA Region 2 Laboratory					
No. of Sample Locations	See Appendices A-K					
QC Sample:	Frequency/Number	Method/SOP QC Acceptance Limits	Corrective Action	Person(s) Responsible for Corrective Action	Data Quality Indicator (DQI)	Measurement Performance Criteria
Tuning/System Stability(ICP-MS)	Per C-109	Pass all the tune/stability criteria	Check Instrument Reanalyze, Retune	Lab personnel	Sensitivity	Pass all the tune/stability criteria
Initial Calibration Verification	Immediately following each calibration ,after every 10 samples and at the end of each analytical run	90%-110%	Check Instrument, Reanalyze	Lab personnel	Accuracy	90%-110%
Continuing Calibration Check Standard (Alternate check standard)	Every 10 samples and at the end of each analytical run	80%-120%	Reanalyze, Qualify data	Lab personnel	Accuracy	80%-120%
Initial Calibration Blank (ICB)	After ICV	< RL	Investigate source of contamination	Lab personnel	Sensitivity Contamination	< RL
Continuing Calibration Blank (CCB)	After every CCV	< RL	Investigate source of contamination	Lab personnel	Sensitivity Contamination	< RL
Low Level Check Standard	At Beginning and end of each analytical run	± 30% of the true value	Check Instrument, Re-calibrate	Lab personnel	Accuracy	± 30% of the true value

¹ Aqueous samples will consist of rinsate blank samples only. Aqueous field duplicate and MS/MSD samples will not be collected.

QAPP Worksheet #28: QC Samples Table (Concluded)

(UFP-QAPP Manual Section 3.4)

Complete a separate worksheet for each sampling technique, analytical method/SOP, matrix, analytical group, and concentration level. If method/SOP QC acceptance limit exceed the measurement performance criteria, the data obtained may be unusable for making project decisions.

Matrix	Soil/ Aqueous ¹					
Analytical Group	TAL Metals & Tin (excluding Hg and CN)					
Concentration Level	Low/Medium					
Sampling SOP	2012					
Analytical Method/ SOP Reference	EPA Method 200.7 / SOP C-109					
Sampler's Name	Scott Snyder/Denise Breen/TBD					
Field Sampling Organization	Weston Solutions, Inc. Region 2 SAT					
Analytical Organization	EPA Region 2 Laboratory					
No. of Sample Locations	See Appendices A-K					
QC Sample:	Frequency/Number	Method/SOP QC Acceptance Limits	Corrective Action	Person(s) Responsible for Corrective Action	Data Quality Indicator (DQI)	Measurement Performance Criteria
Interference Check Sample (ICP-200.7)	At beginning and end of each analytical run	< RL	Per C-109	Lab personnel	Precision	< RL
Method blank	1 per extraction batch of ≤ 20 samples	< RL	Investigate source of contamination	Lab personnel	Sensitivity Contamination	< RL
LCS/LFB	2 per extraction batch of ≤ 20 samples	Limits: Average Recovery ± 20% aqueous, ± 25% Soil % RPD < 20(Aq), % RPD <25(Soil)	Qualify data	Lab personnel	Accuracy/ Precision	Limits: Average Recovery ± 20% aqueous, ± 25% Soil % RPD < 20(Aq), % RPD <25(Soil)
Laboratory Matrix spikes	1 per extraction batch of ≤ 20 samples	Limits ± 20% aqueous, ± 25% soil)	Qualify data	Lab personnel	Accuracy	Limits ± 20% aqueous, ± 25% Soil)
Serial Dilution Test (ICP-200.7)	Matrix spike sample	RPD < 20 %	Qualify data	Lab personnel	Precision	RPD < 20 %

¹ Aqueous samples will consist of rinsate blank samples only. Aqueous field duplicate and MS/MSD samples will not be collected.

QAPP Worksheet #29: Project Documents and Records Table

Sample Collection Documents and Records	Analysis Documents and Records	Data Assessment Documents and Records	Other
<ul style="list-style-type: none"> • Field logbooks • Field data sheets • Photo-documentation • COC forms • GIS map for sampling locations 	<ul style="list-style-type: none"> • Sample receipt logs • Internal and external COC forms • Equipment calibration logs • Sample preparation worksheets/logs • Sample analysis worksheets/run logs • Telephone/email logs • Corrective action documentation 	<ul style="list-style-type: none"> • Data validation reports • Field inspection checklist(s) • Corrective action documentation • Laboratory final data package • PA/SI Report with HRS scoresheets 	

QAPP Worksheet #30: Analytical Services Table

Matrix	Analytical Group	Concentration Level	Analytical SOP	Data Package Turnaround Time	Laboratory/Organization (Name and Address, Contact Person and Telephone Number)	Backup Laboratory/Organization (Name and Address, Contact Person and Telephone Number)
Soil	TAL Metals & Tin (excluding Hg and CN ⁻)	Low/Medium	Region 2 Laboratory SOP C-109, Determination of Metals in Aqueous, TCLP Extract, Soil/Sediment, Sludge, and Biological Tissue Samples by ICP-AES (Ref. EPA 200.7)	60 days (final)	EPA Region 2 Laboratory 2890 Woodbridge Ave. Bldg. 209, MS-230 Edison, NJ 08837	N/A

SOP – Standard Operating Procedure

TAL – Target Analyte List

QAPP Worksheet #31: Planned Project Assessments Table

Assessment Type	Frequency	Internal or External	Organization Performing Assessment	Person(s) Responsible for Performing Assessment (Title and Organizational Affiliation)	Person(s) Responsible for Responding to Assessment Findings (Title and Organizational Affiliation)	Person(s) Responsible for Identifying and Implementing Corrective Actions (Title and Organizational Affiliation)	Person(s) Responsible for Monitoring Effectiveness of Corrective Actions (Title and Organizational Affiliation)
Laboratory Technical Systems/ Performance Audits	As required	External	Regulatory Agency	Regulatory Agency	Non-CLP (NELAC) Laboratory	Non-CLP (NELAC) Laboratory	EPA or other Regulatory Agency
Performance Evaluation Samples	As required	External	Regulatory Agency	Regulatory Agency	Non-CLP (NELAC) Laboratory	Non-CLP (NELAC) Laboratory	EPA or other Regulatory Agency
NELAC	Biannually	External	NELAC	NELAC Representative	Lab QA Officer	Lab Personnel	NELAC Representative
Internal Audit	Monthly	Internal	EPA Region 2 Laboratory	Lab QA Officer	Lab Personnel	Lab Personnel	Lab QA Officer

QAPP Worksheet #32: Assessment Findings and Corrective Action Responses

Assessment Type	Nature of Deficiencies Documentation	Individual(s) Notified of Findings (Name, Title, Organization)	Timeframe of Notification	Nature of Corrective Action Response Documentation	Individual(s) Receiving Corrective Action Response (Name, Title, Org.)	Timeframe for Response
Project Readiness Review	Checklist or logbook entry	Region 2 SAT SM	Immediately to within 24 hours of review	Checklist or logbook entry	Region 2 SAT PM	Immediately to within 24 hours of review
Field Observations/ Deviations from Work Plan	Logbook entry	Region 2 SAT SM and EPA TOCOR Designee	Immediately to within 24 hours of deviation	Logbook entry	Region 2 SAT PM and EPA TOCOR Designee	Immediately to within 24 hours of deviation
Laboratory Technical Systems/ Performance Audits	Written report	EPA Region 2 Laboratory	30 days	Letter	EPA Region 2 DESA-HWSB	14 days
On-Site Field Inspection	Written report	Region 2 SAT SM	7 calendar days after completion of the audit	Letter/Internal Memorandum	Region 2 SAT PM and EPA TOCOR Designee	To be identified in the cover letter of the report
Performance Evaluation Samples	Electronic report	EPA Laboratory Manager	30 days	Letter or written report	EPA Region 2 DESA-HWSB	14 days

QAPP Worksheet #33: QA Management Reports Table

Type of Report	Frequency (Daily, weekly, monthly, quarterly, annually, etc.)	Projected Delivery Date(s)	Person(s) Responsible for Report Preparation (Title and Organizational Affiliation)	Report Recipient(s) (Title and Organizational Affiliation)
EPA Region 2 Laboratory data package	As performed	Final data package due 60 days after receipt of last sample (per site)	EPA Region 2 Laboratory	Region 2 SAT PM and EPA Region 2 TOCOR Designee
On-Site Field Inspection	As performed	Within 14 calendar days after completion of the inspection	Region 2 SAT HSO or QAO	Region 2 SAT PM
PA/SI Report	As performed	Within 60 days after receipt of EPA COR approval of data package	Region 2 SAT SM	EPA Region 2 TOCOR Designee

QAPP Worksheet #34: Verification (Step I) Process Table

Verification Input	Description	Internal/ External	Responsible for Verification (Name, Organization)
Site/field logbooks	Field notes will be prepared daily by Region 2 SAT sampling personnel and will be complete, appropriate, legible and pertinent. Upon completion of field work, logbooks will be placed in the project files.	I	Region 2 SAT SM
Chains of custody	COC forms will be reviewed against the samples packed in the specific cooler prior to shipment. An original COC will be sent with the samples to the laboratory, while copies are retained for (1) the Sampling Trip Report and (2) the project files.	I	Region 2 SAT project personnel
Sampling Trip Reports	STRs will be prepared for each site. Information in the STR will be reviewed against the COC forms, and potential discrepancies will be discussed with field personnel to verify locations, dates, etc.	I	Region 2 SAT SM
Laboratory analytical data package	Data packages will be reviewed/verified internally by the laboratory performing the work for completeness and technical accuracy prior to submittal.	I	EPA Region 2 laboratory and data validation personnel
Laboratory analytical data package	Data packages will be reviewed as to content and sample information upon receipt by the EPA TOCOR Designee and Region 2 SAT SM.	I	EPA TOCOR Designee and Region 2 SAT SM
Final PA/SI Report	The PA/SI can be used to determine if on-site waste sources are present and if nearby targets are exposed to site-related contamination.	I	Region 2 SAT PM

QAPP Worksheet #35: Validation (Steps IIa and IIb) Process Table

Step IIa/IIb	Validation Input	Description	Responsible for Validation (Name, Organization)
IIa	SOPs	Ensure that the sampling methods/procedures outlined in QAPP were followed, and that any deviations were noted/approved.	Region 2 SAT project personnel
IIb	SOPs	Determine potential impacts from noted/approved deviations, in regard to PQOs.	Region 2 SAT project personnel
IIa	Chains of custody	Verify chain-of-custody forms against the sample coolers they represent and complete the Sample Acceptance Checklist. The OSCAR staff supervisor utilizes the analyses request information and the external COC to review the accuracy and completeness of LIMS log-in entries, as reflected on the LIMS Sample Receipt Form.	EPA Region 2 Laboratory OSCAR personnel
IIb	Chains of custody	Examine COC forms against QAPP and laboratory contract requirements (e.g., analytical methods, sample identification, etc.).	EPA Region 2 Laboratory personnel
IIa	Laboratory data package	Examine packages against QAPP and laboratory contract requirements, and against COC forms (e.g., holding times, sample handling, analytical methods, sample identification, data qualifiers, QC samples, etc.).	EPA Region 2 Laboratory personnel
IIb	Laboratory data package	Determine potential impacts from noted/approved deviations, in regard to PQOs. Examples include PQLs and QC sample limits (precision/accuracy).	EPA Region 2 Laboratory personnel
IIb	Field duplicates	Compare results of field duplicate (or replicate) analyses with RPD criteria.	Region 2 SAT project personnel

QAPP Worksheet #36: Validation (Steps IIa and IIb) Summary Table

Step IIa/IIb	Matrix	Analytical Group	Concentration Level	Validation Criteria	Data Validator (title and organizational affiliation)
IIa / IIb	Soil and Aqueous	TAL Metals & Tin (excluding Hg and CN ⁻)	Low/Medium	Data validation according to SOP C-109, Determination of Metals in Aqueous, TCLP Extract, Soil/Sediment, Sludge, and Biological Tissue Samples by ICP-AES	EPA Region 2 data validation personnel

QAPP Worksheet #37: Usability Assessment

Summarize the usability assessment process and all procedures, including interim steps and any statistics, equations, and computer algorithms that will be used: A hard copy of field data for each site is maintained in a designated site logbook, and on field data sheets as applicable, which will be usable as a project reference. WESTON Region 2 SAT will perform post-processing of GPS data in accordance with EPA Region 2 guidelines, and will consider the accuracy and usability of the locational data. Laboratory data packages are validated, and final data reports are generated. The data validator will review and qualify chemical analytical data for usability according to EPA Region 2 SOPs (see Worksheet #36). Questions raised during the analytical data review process are resolved by contacting the respective site and laboratory personnel as appropriate for resolution. All communications are documented in the data validation record with comments as to resolution of the observed deficiencies. For J-qualified results (i.e., estimated values), Region 2 SAT will assess usability according to EPA 540-F-94-028, *Using Qualified Data to Document an Observed Release and Observed Contamination*, November 1996.

Describe the evaluative procedures used to assess overall measurement error associated with the project: Based on UFP-QAPP guidance, Region 2 SAT implements a “Graded Approach” for data collection activities that are either exploratory or small in nature or where specific decisions cannot be identified, since this guidance indicates that the formal DQO process is not necessary. Region 2 SAT will initially use a systematic planning process to identify PQOs, action limits, and to select appropriate sampling, analytical, and assessment activities. The validation process determines if the data satisfy the QA criteria. After the data pass the data validation process, Region 2 SAT will evaluate the results according to the HRS. EPA will use the analytical data from this investigation to determine if soils at the sites contain elevated concentrations of metals, specifically lead and common alloy materials such as tin, in comparison to EPA Generic RMLs.

Identify the personnel responsible for performing the usability assessment: Region 2 data validation personnel, Region 2 SAT HRS-trained personnel, EPA Region 2 TOCOR Designee, and EPA Region 2 OSCs.

Describe the documentation that will be generated during usability assessment and how usability assessment results will be presented so that they identify trends, relationships (correlations), and anomalies: The list of documentation generated during the usability assessment may include tables, graphs, maps, or text reports developed to assist the data user and present results. A copy of the most current approved QAPP is provided to all personnel identified on the distribution list, and an electronic copy is available in the WESTON Region 2 SAT local area network folder. All data deliverable files (original, analytical, hard copies, electronic copies, etc.) will be copied and provided to EPA in the appropriate format.

APPENDIX A: Task 1401 – Buffalo White Metal Co., Buffalo, NY

Figure 1 – Site Location Map

Figure 2 – Proposed Sample Locations

Table 1 – Summary of Analytical Services

Table 2 – Sample Descriptions/Rationale

Figure 2A – Proposed Alternate Site Sample Locations

Table 2A – Sample Descriptions/Rationale - Alternate Sample Locations

**APPENDIX B: Task 1402 – Reliance Lead, Solder & Babbitt Co., Buffalo,
NY**

Figure 1 – Site Location Map

Figure 2 – Proposed Sample Locations

Table 1 – Summary of Analytical Services

Table 2 – Sample Descriptions/Rationale

Figure 2A – Proposed Alternate Site Sample Locations

Table 2A – Sample Descriptions/Rationale - Alternate Sample Locations

APPENDIX C: Task 1403 – New York Solder Co., The Bronx, NY

Figure 1 – Site Location Map

Figure 2 – Proposed Sample Locations

Table 1 – Summary of Analytical Services

Table 2 – Sample Descriptions/Rationale

Figure 2A – Proposed Alternate Site Sample Locations

Table 2A – Sample Descriptions/Rationale - Alternate Sample Locations

APPENDIX D: Task 1404 – Lumen Bearing Co., Buffalo, NY

Figure 1 – Site Location Map

Figure 2 – Proposed Sample Locations

Table 1 – Summary of Analytical Services

Table 2 – Sample Descriptions/Rationale

APPENDIX E: Task 1405 – Lake Erie Smelting Corp., Buffalo, NY

Figure 1 – Site Location Map

Figure 2 – Proposed Sample Locations

Table 1 – Summary of Analytical Services

Table 2 – Sample Descriptions/Rationale

**APPENDIX F: Task 1406 – Niagara Falls Smelting & Refining, Buffalo,
NY**

Figure 1 – Site Location Map

Figure 2 – Proposed Sample Locations

Table 1 – Summary of Analytical Services

Table 2 – Sample Descriptions/Rationale

APPENDIX G: Task 1407 – Samuel Greenfield Co., Buffalo, NY

Figure 1 – Site Location Map

Figure 2 – Proposed Sample Locations

Table 1 – Summary of Analytical Services

Table 2 – Sample Descriptions/Rationale

Figure 2A – Proposed Alternate Site Sample Locations

Table 2A – Sample Descriptions/Rationale - Alternate Sample Locations

APPENDIX H: Task 1408 – Kornblum, Sidney Metals Co., Brooklyn, NY

Figure 1 – Site Location Map

Figure 2 – Proposed Sample Locations

Table 1 – Summary of Analytical Services

Table 2 – Sample Descriptions/Rationale

APPENDIX I: Task 1409 – Pittsburgh White Metal, Brooklyn, NY

Figure 1 – Site Location Map

Figure 2 – Proposed Sample Locations

Table 1 – Summary of Analytical Services

Table 2 – Sample Descriptions/Rationale

APPENDIX J: Task 1410 – Empire Metal Co., Syracuse, NY

Figure 1 – Site Location Map

Figure 2 – Proposed Sample Locations

Table 1 – Summary of Analytical Services

Table 2 – Sample Descriptions/Rationale

**APPENDIX K: Task 1411 – Columbia Smelting & Refining Works,
Brooklyn, NY**

Figure 1 – Site Location Map

Figure 2 – Proposed Sample Locations

Table 1 – Summary of Analytical Services

Table 2 – Sample Descriptions/Rationale

ATTACHMENT 1: Sampling SOPs

EPA/ERT SOP # 2001

EPA/ERT SOP # 2006

EPA/ERT SOP # 2012



GENERAL FIELD SAMPLING GUIDELINES

SOP#: 2001
DATE: 08/11/94
REV. #: 0.0

1.0 SCOPE AND APPLICATION

The purpose of this Standard Operating Procedure (SOP) is to provide general field sampling guidelines that will assist REAC personnel in choosing sampling strategies, location, and frequency for proper assessment of site characteristics. This SOP is applicable to all field activities that involve sampling.

These are standard (i.e., typically applicable) operating procedures which may be varied or changed as required, dependent on site conditions, equipment limitations or limitations imposed by the procedure. In all instances, the ultimate procedures employed should be documented and associated with the final report.

Mention of trade names or commercial products does not constitute U.S. EPA endorsement or recommendation for use.

2.0 METHOD SUMMARY

Sampling is the selection of a representative portion of a larger population, universe, or body. Through examination of a sample, the characteristics of the larger body from which the sample was drawn can be inferred. In this manner, sampling can be a valuable tool for determining the presence, type, and extent of contamination by hazardous substances in the environment.

The primary objective of all sampling activities is to characterize a hazardous waste site accurately so that its impact on human health and the environment can be properly evaluated. It is only through sampling and analysis that site hazards can be measured and the job of cleanup and restoration can be accomplished effectively with minimal risk. The sampling itself must be conducted so that every sample collected retains its original physical form and chemical composition. In this way, sample integrity is insured, quality assurance standards are maintained, and the sample can accurately represent the larger body of

material under investigation.

The extent to which valid inferences can be drawn from a sample depends on the degree to which the sampling effort conforms to the project's objectives. For example, as few as one sample may produce adequate, technically valid data to address the project's objectives. Meeting the project's objectives requires thorough planning of sampling activities, and implementation of the most appropriate sampling and analytical procedures. These issues will be discussed in this procedure.

3.0 SAMPLE PRESERVATION, CONTAINERS, HANDLING, AND STORAGE

The amount of sample to be collected, and the proper sample container type (i.e., glass, plastic), chemical preservation, and storage requirements are dependent on the matrix being sampled and the parameter(s) of interest. Sample preservation, containers, handling, and storage for air and waste samples are discussed in the specific SOPs for air and waste sampling techniques.

4.0 INTERFERENCES AND POTENTIAL PROBLEMS

The nature of the object or materials being sampled may be a potential problem to the sampler. If a material is homogeneous, it will generally have a uniform composition throughout. In this case, any sample increment can be considered representative of the material. On the other hand, heterogeneous samples present problems to the sampler because of changes in the material over distance, both laterally and vertically.

Samples of hazardous materials may pose a safety threat to both field and laboratory personnel. Proper health and safety precautions should be implemented when handling this type of sample.

Environmental conditions, weather conditions, or non-target chemicals may cause problems and/or interferences when performing sampling activities or when sampling for a specific parameter. Refer to the specific SOPs for sampling techniques.

5.0 EQUIPMENT/APPARATUS

The equipment/apparatus required to collect samples must be determined on a site specific basis. Due to the wide variety of sampling equipment available, refer to the specific SOPs for sampling techniques which include lists of the equipment/apparatus required for sampling.

6.0 REAGENTS

Reagents may be utilized for preservation of samples and for decontamination of sampling equipment. The preservatives required are specified by the analysis to be performed. Decontamination solutions are specified in ERT SOP #2006, Sampling Equipment Decontamination.

7.0 PROCEDURE

7.1 Types of Samples

In relation to the media to be sampled, two basic types of samples can be considered: the environmental sample and the hazardous sample.

Environmental samples are those collected from streams, ponds, lakes, wells, and are off-site samples that are not expected to be contaminated with hazardous materials. They usually do not require the special handling procedures typically used for concentrated wastes. However, in certain instances, environmental samples can contain elevated concentrations of pollutants and in such cases would have to be handled as hazardous samples.

Hazardous or concentrated samples are those collected from drums, tanks, lagoons, pits, waste piles, fresh spills, or areas previously identified as contaminated, and require special handling procedures because of their potential toxicity or hazard. These samples can be further subdivided based on their degree of hazard; however, care should be taken when handling and shipping any wastes believed to be concentrated regardless of the degree.

The importance of making the distinction between environmental and hazardous samples is two-fold:

- (1) Personnel safety requirements: Any sample thought to contain enough hazardous materials to pose a safety threat should be designated as hazardous and handled in a manner which ensures the safety of both field and laboratory personnel.
- (2) Transportation requirements: Hazardous samples must be packaged, labeled, and shipped according to the International Air Transport Association (IATA) Dangerous Goods Regulations or Department of Transportation (DOT) regulations and U.S. EPA guidelines.

7.2 Sample Collection Techniques

In general, two basic types of sample collection techniques are recognized, both of which can be used for either environmental or hazardous samples.

Grab Samples

A grab sample is defined as a discrete aliquot representative of a specific location at a given point in time. The sample is collected all at once at one particular point in the sample medium. The representativeness of such samples is defined by the nature of the materials being sampled. In general, as sources vary over time and distance, the representativeness of grab samples will decrease.

Composite Samples

Composites are nondiscrete samples composed of more than one specific aliquot collected at various sampling locations and/or different points in time. Analysis of this type of sample produces an average value and can in certain instances be used as an alternative to analyzing a number of individual grab samples and calculating an average value. It should be noted, however, that compositing can mask problems by diluting isolated concentrations of some hazardous compounds below detection limits.

Compositing is often used for environmental samples and may be used for hazardous samples under certain conditions. For example, compositing of hazardous waste is often performed after compatibility tests have

been completed to determine an average value over a number of different locations (group of drums). This procedure generates data that can be useful by providing an average concentration within a number of units, can serve to keep analytical costs down, and can provide information useful to transporters and waste disposal operations.

For sampling situations involving hazardous wastes, grab sampling techniques are generally preferred because grab sampling minimizes the amount of time sampling personnel must be in contact with the wastes, reduces risks associated with compositing unknowns, and eliminates chemical changes that might occur due to compositing.

7.3 Types of Sampling Strategies

The number of samples that should be collected and analyzed depends on the objective of the investigation. There are three basic sampling strategies: random, systematic, and judgmental sampling.

Random sampling involves collection of samples in a nonsystematic fashion from the entire site or a specific portion of a site. Systematic sampling involves collection of samples based on a grid or a pattern which has been previously established. When judgmental sampling is performed, samples are collected only from the portion(s) of the site most likely to be contaminated. Often, a combination of these strategies is the best approach depending on the type of the suspected/known contamination, the uniformity and size of the site, the level/type of information desired, etc.

7.4 QA Work Plans (QAWP)

A QAWP is required when it becomes evident that a field investigation is necessary. It should be initiated in conjunction with, or immediately following, notification of the field investigation. This plan should be clear and concise and should detail the following basic components, with regard to sampling activities:

- C Objective and purpose of the investigation.
- C Basis upon which data will be evaluated.
- C Information known about the site including location, type and size of the facility, and length of operations/abandonment.
- C Type and volume of contaminated material, contaminants of concern (including

concentration), and basis of the information/data.

- C Technical approach including media/matrix to be sampled, sampling equipment to be used, sample equipment decontamination (if necessary), sampling design and rationale, and SOPs or description of the procedure to be implemented.
- C Project management and reporting, schedule, project organization and responsibilities, manpower and cost projections, and required deliverables.
- C QA objectives and protocols including tables summarizing field sampling and QA/QC analysis and objectives.

Note that this list of QAWP components is not all-inclusive and that additional elements may be added or altered depending on the specific requirements of the field investigation. It should also be recognized that although a detailed QAWP is quite important, it may be impractical in some instances. Emergency responses and accidental spills are prime examples of such instances where time might prohibit the development of site-specific QAWPs prior to field activities. In such cases, investigators would have to rely on general guidelines and personal judgment, and the sampling or response plans might simply be a strategy based on preliminary information and finalized on site. In any event, a plan of action should be developed, no matter how concise or informal, to aid investigators in maintaining a logical and consistent order to the implementation of their task.

7.5 Legal Implications

The data derived from sampling activities are often introduced as critical evidence during litigation of a hazardous waste site cleanup. Legal issues in which sampling data are important may include cleanup cost recovery, identification of pollution sources and responsible parties, and technical validation of remedial design methodologies. Because of the potential for involvement in legal actions, strict adherence to technical and administrative SOPs is essential during both the development and implementation of sampling activities.

Technically valid sampling begins with thorough planning and continues through the sample collection and analytical procedures. Administrative requirements involve thorough, accurate

documentation of all sampling activities. Documentation requirements include maintenance of a chain of custody, as well as accurate records of field activities and analytical instructions. Failure to observe these procedures fully and consistently may result in data that are questionable, invalid and non-defensible in court, and the consequent loss of enforcement proceedings.

8.0 CALCULATIONS

Refer to the specific SOPs for any calculations which are associated with sampling techniques.

9.0 QUALITY ASSURANCE/ QUALITY CONTROL

Refer to the specific SOPs for the type and frequency of QA/QC samples to be analyzed, the acceptance criteria for the QA/QC samples, and any other QA/QC activities which are associated with sampling techniques.

10.0 DATA VALIDATION

Refer to the specific SOPs for data validation activities that are associated with sampling techniques.

11.0 HEALTH AND SAFETY

When working with potentially hazardous materials, follow U.S. EPA, OSHA, and corporate health and safety procedures.



SAMPLING EQUIPMENT DECONTAMINATION

SOP#: 2006
DATE: 08/11/94
REV. #: 0.0

1.0 SCOPE AND APPLICATION

The purpose of this Standard Operating Procedure (SOP) is to provide a description of the methods used for preventing, minimizing, or limiting cross-contamination of samples due to inappropriate or inadequate equipment decontamination and to provide general guidelines for developing decontamination procedures for sampling equipment to be used during hazardous waste operations as per 29 Code of Federal Regulations (CFR) 1910.120. This SOP does not address personnel decontamination.

These are standard (i.e. typically applicable) operating procedures which may be varied or changed as required, dependent upon site conditions, equipment limitation, or limitations imposed by the procedure. In all instances, the ultimate procedures employed should be documented and associated with the final report.

Mention of trade names or commercial products does not constitute U.S. Environmental Protection Agency (U.S. EPA) endorsement or recommendation for use.

2.0 METHOD SUMMARY

Removing or neutralizing contaminants from equipment minimizes the likelihood of sample cross contamination, reduces or eliminates transfer of contaminants to clean areas, and prevents the mixing of incompatible substances.

Gross contamination can be removed by physical decontamination procedures. These abrasive and non-abrasive methods include the use of brushes, air and wet blasting, and high and low pressure water cleaning.

The first step, a soap and water wash, removes all visible particulate matter and residual oils and grease. This may be preceded by a steam or high pressure

water wash to facilitate residuals removal. The second step involves a tap water rinse and a distilled/deionized water rinse to remove the detergent. An acid rinse provides a low pH media for trace metals removal and is included in the decontamination process if metal samples are to be collected. It is followed by another distilled/deionized water rinse. If sample analysis does not include metals, the acid rinse step can be omitted. Next, a high purity solvent rinse is performed for trace organics removal if organics are a concern at the site. Typical solvents used for removal of organic contaminants include acetone, hexane, or water. Acetone is typically chosen because it is an excellent solvent, miscible in water, and not a target analyte on the Priority Pollutant List. If acetone is known to be a contaminant of concern at a given site or if Target Compound List analysis (which includes acetone) is to be performed, another solvent may be substituted. The solvent must be allowed to evaporate completely and then a final distilled/deionized water rinse is performed. This rinse removes any residual traces of the solvent.

The decontamination procedure described above may be summarized as follows:

1. Physical removal
2. Non-phosphate detergent wash
3. Tap water rinse
4. Distilled/deionized water rinse
5. 10% nitric acid rinse
6. Distilled/deionized water rinse
7. Solvent rinse (pesticide grade)
8. Air dry
9. Distilled/deionized water rinse

If a particular contaminant fraction is not present at the site, the nine (9) step decontamination procedure specified above may be modified for site specificity. For example, the nitric acid rinse may be eliminated if metals are not of concern at a site. Similarly, the solvent rinse may be eliminated if organics are not of

concern at a site. Modifications to the standard procedure should be documented in the site specific work plan or subsequent report.

3.0 SAMPLE PRESERVATION, CONTAINERS, HANDLING, AND STORAGE

The amount of sample to be collected and the proper sample container type (i.e., glass, plastic), chemical preservation, and storage requirements are dependent on the matrix being sampled and the parameter(s) of interest.

More specifically, sample collection and analysis of decontamination waste may be required before beginning proper disposal of decontamination liquids and solids generated at a site. This should be determined prior to initiation of site activities.

4.0 INTERFERENCES AND POTENTIAL PROBLEMS

- C The use of distilled/deionized water commonly available from commercial vendors may be acceptable for decontamination of sampling equipment provided that it has been verified by laboratory analysis to be analyte free (specifically for the contaminants of concern).
- C The use of an untreated potable water supply is not an acceptable substitute for tap water. Tap water may be used from any municipal or industrial water treatment system.
- C If acids or solvents are utilized in decontamination they raise health and safety, and waste disposal concerns.
- C Damage can be incurred by acid and solvent washing of complex and sophisticated sampling equipment.

5.0 EQUIPMENT/APPARATUS

Decontamination equipment, materials, and supplies are generally selected based on availability. Other considerations include the ease of decontaminating or disposing of the equipment. Most equipment and supplies can be easily procured. For example, soft-

bristle scrub brushes or long-handled bottle brushes can be used to remove contaminants. Large galvanized wash tubs, stock tanks, or buckets can hold wash and rinse solutions. Children's wading pools can also be used. Large plastic garbage cans or other similar containers lined with plastic bags can help segregate contaminated equipment. Contaminated liquid can be stored temporarily in metal or plastic cans or drums.

The following standard materials and equipment are recommended for decontamination activities:

5.1 Decontamination Solutions

- C Non-phosphate detergent
- C Selected solvents (acetone, hexane, nitric acid, etc.)
- C Tap water
- C Distilled or deionized water

5.2 Decontamination Tools/Supplies

- C Long and short handled brushes
- C Bottle brushes
- C Drop cloth/plastic sheeting
- C Paper towels
- C Plastic or galvanized tubs or buckets
- C Pressurized sprayers (H₂O)
- C Solvent sprayers
- C Aluminum foil

5.3 Health and Safety Equipment

Appropriate personal protective equipment (i.e., safety glasses or splash shield, appropriate gloves, aprons or coveralls, respirator, emergency eye wash)

5.4 Waste Disposal

- C Trash bags
- C Trash containers
- C 55-gallon drums
- C Metal/plastic buckets/containers for storage and disposal of decontamination solutions

6.0 REAGENTS

There are no reagents used in this procedure aside from the actual decontamination solutions. Table 1 (Appendix A) lists solvent rinses which may be required for elimination of particular chemicals. In

general, the following solvents are typically utilized for decontamination purposes:

- C 10% nitric acid is typically used for inorganic compounds such as metals. An acid rinse may not be required if inorganics are not a contaminant of concern.
- C Acetone (pesticide grade)⁽¹⁾
- C Hexane (pesticide grade)⁽¹⁾
- C Methanol⁽¹⁾

⁽¹⁾ - Only if sample is to be analyzed for organics.

7.0 PROCEDURES

As part of the health and safety plan, a decontamination plan should be developed and reviewed. The decontamination line should be set up before any personnel or equipment enter the areas of potential exposure. The equipment decontamination plan should include:

- C The number, location, and layout of decontamination stations.
- C Decontamination equipment needed.
- C Appropriate decontamination methods.
- C Methods for disposal of contaminated clothing, equipment, and solutions.
- C Procedures can be established to minimize the potential for contamination. This may include: (1) work practices that minimize contact with potential contaminants; (2) using remote sampling techniques; (3) covering monitoring and sampling equipment with plastic, aluminum foil, or other protective material; (4) watering down dusty areas; (5) avoiding laying down equipment in areas of obvious contamination; and (6) use of disposable sampling equipment.

7.1 Decontamination Methods

All samples and equipment leaving the contaminated area of a site must be decontaminated to remove any contamination that may have adhered to equipment. Various decontamination methods will remove contaminants by: (1) flushing or other physical action, or (2) chemical complexing to inactivate

contaminants by neutralization, chemical reaction, disinfection, or sterilization.

Physical decontamination techniques can be grouped into two categories: abrasive methods and non-abrasive methods, as follows:

7.1.1 Abrasive Cleaning Methods

Abrasive cleaning methods work by rubbing and wearing away the top layer of the surface containing the contaminant. The mechanical abrasive cleaning methods are most commonly used at hazardous waste sites. The following abrasive methods are available:

Mechanical

Mechanical methods of decontamination include using metal or nylon brushes. The amount and type of contaminants removed will vary with the hardness of bristles, length of time brushed, degree of brush contact, degree of contamination, nature of the surface being cleaned, and degree of contaminant adherence to the surface.

Air Blasting

Air blasting equipment uses compressed air to force abrasive material through a nozzle at high velocities. The distance between nozzle and surface cleaned, air pressure, time of application, and angle at which the abrasive strikes the surface will dictate cleaning efficiency. Disadvantages of this method are the inability to control the amount of material removed and the large amount of waste generated.

Wet Blasting

Wet blast cleaning involves use of a suspended fine abrasive. The abrasive/water mixture is delivered by compressed air to the contaminated area. By using a very fine abrasive, the amount of materials removed can be carefully controlled.

7.1.2 Non-Abrasive Cleaning Methods

Non-abrasive cleaning methods work by forcing the contaminant off a surface with pressure. In general, the equipment surface is not removed using non-abrasive methods.

Low-Pressure Water

This method consists of a container which is filled with water. The user pumps air out of the container to create a vacuum. A slender nozzle and hose allow the user to spray in hard-to-reach places.

High-Pressure Water

This method consists of a high-pressure pump, an operator controlled directional nozzle, and a high-pressure hose. Operating pressure usually ranges from 340 to 680 atmospheres (atm) and flow rates usually range from 20 to 140 liters per minute.

Ultra-High-Pressure Water

This system produces a water jet that is pressured from 1,000 to 4,000 atmospheres. This ultra-high-pressure spray can remove tightly-adhered surface films. The water velocity ranges from 500 meters/second (m/s) (1,000 atm) to 900 m/s (4,000 atm). Additives can be used to enhance the cleaning action.

Rinsing

Contaminants are removed by rinsing through dilution, physical attraction, and solubilization.

Damp Cloth Removal

In some instances, due to sensitive, non-waterproof equipment or due to the unlikelihood of equipment being contaminated, it is not necessary to conduct an extensive decontamination procedure. For example, air sampling pumps hooked on a fence, placed on a drum, or wrapped in plastic bags are not likely to become heavily contaminated. A damp cloth should be used to wipe off contaminants which may have adhered to equipment through airborne contaminants or from surfaces upon which the equipment was set.

Disinfection/Sterilization

Disinfectants are a practical means of inactivating infectious agents. Unfortunately, standard sterilization methods are impractical for large equipment. This method of decontamination is typically performed off-site.

7.2 Field Sampling Equipment Decontamination Procedures

The decontamination line is setup so that the first station is used to clean the most contaminated item. It progresses to the last station where the least contaminated item is cleaned. The spread of contaminants is further reduced by separating each decontamination station by a minimum of three (3) feet. Ideally, the contamination should decrease as the equipment progresses from one station to another farther along in the line.

A site is typically divided up into the following boundaries: Hot Zone or Exclusion Zone (EZ), the Contamination Reduction Zone (CRZ), and the Support or Safe Zone (SZ). The decontamination line should be setup in the Contamination Reduction Corridor (CRC) which is in the CRZ. Figure 1 (Appendix B) shows a typical contaminant reduction zone layout. The CRC controls access into and out of the exclusion zone and confines decontamination activities to a limited area. The CRC boundaries should be conspicuously marked. The far end is the hotline, the boundary between the exclusion zone and the contamination reduction zone. The size of the decontamination corridor depends on the number of stations in the decontamination process, overall dimensions of the work zones, and amount of space available at the site. Whenever possible, it should be a straight line.

Anyone in the CRC should be wearing the level of protection designated for the decontamination crew. Another corridor may be required for the entry and exit of heavy equipment. Sampling and monitoring equipment and sampling supplies are all maintained outside of the CRC. Personnel don their equipment away from the CRC and enter the exclusion zone through a separate access control point at the hotline. One person (or more) dedicated to decontaminating equipment is recommended.

7.2.1 Decontamination Setup

Starting with the most contaminated station, the decontamination setup should be as follows:

Station 1: Segregate Equipment Drop

Place plastic sheeting on the ground (Figure 2, Appendix B). Size will depend on amount of

equipment to be decontaminated. Provide containers lined with plastic if equipment is to be segregated. Segregation may be required if sensitive equipment or mildly contaminated equipment is used at the same time as equipment which is likely to be heavily contaminated.

Station 2: Physical Removal With A High-Pressure Washer (Optional)

As indicated in 7.1.2, a high-pressure wash may be required for compounds which are difficult to remove by washing with brushes. The elevated temperature of the water from the high-pressure washers is excellent at removing greasy/oily compounds. High pressure washers require water and electricity.

A decontamination pad may be required for the high-pressure wash area. An example of a wash pad may consist of an approximately 1 1/2 foot-deep basin lined with plastic sheeting and sloped to a sump at one corner. A layer of sand can be placed over the plastic and the basin is filled with gravel or shell. The sump is also lined with visqueen and a barrel is placed in the hole to prevent collapse. A sump pump is used to remove the water from the sump for transfer into a drum.

Typically heavy machinery is decontaminated at the end of the day unless site sampling requires that the machinery be decontaminated frequently. A separate decontamination pad may be required for heavy equipment.

Station 3: Physical Removal With Brushes And A Wash Basin

Prior to setting up Station 3, place plastic sheeting on the ground to cover areas under Station 3 through Station 10.

Fill a wash basin, a large bucket, or child's swimming pool with non-phosphate detergent and tap water. Several bottle and bristle brushes to physically remove contamination should be dedicated to this station. Approximately 10 - 50 gallons of water may be required initially depending upon the amount of equipment to decontaminate and the amount of gross contamination.

Station 4: Water Basin

Fill a wash basin, a large bucket, or child's swimming

pool with tap water. Several bottle and bristle brushes should be dedicated to this station. Approximately 10-50 gallons of water may be required initially depending upon the amount of equipment to decontaminate and the amount of gross contamination.

Station 5: Low-Pressure Sprayers

Fill a low-pressure sprayer with distilled/deionized water. Provide a 5-gallon bucket or basin to contain the water during the rinsing process. Approximately 10-20 gallons of water may be required initially depending upon the amount of equipment to decontaminate and the amount of gross contamination.

Station 6: Nitric Acid Sprayers

Fill a spray bottle with 10% nitric acid. An acid rinse may not be required if inorganics are not a contaminant of concern. The amount of acid will depend on the amount of equipment to be decontaminated. Provide a 5-gallon bucket or basin to collect acid during the rinsing process.

Station 7: Low-Pressure Sprayers

Fill a low-pressure sprayer with distilled/deionized water. Provide a 5-gallon bucket or basin to collect water during the rinsate process.

Station 8: Organic Solvent Sprayers

Fill a spray bottle with an organic solvent. After each solvent rinse, the equipment should be rinsed with distilled/deionized water and air dried. Amount of solvent will depend on the amount of equipment to decontaminate. Provide a 5-gallon bucket or basin to collect the solvent during the rinsing process.

Solvent rinses may not be required unless organics are a contaminant of concern, and may be eliminated from the station sequence.

Station 9: Low-Pressure Sprayers

Fill a low-pressure sprayer with distilled/deionized water. Provide a 5-gallon bucket or basin to collect water during the rinsate process.

Station 10: Clean Equipment Drop

Lay a clean piece of plastic sheeting over the bottom

plastic layer. This will allow easy removal of the plastic in the event that it becomes dirty. Provide aluminum foil, plastic, or other protective material to wrap clean equipment.

7.2.2 Decontamination Procedures

Station 1: Segregate Equipment Drop

Deposit equipment used on-site (i.e., tools, sampling devices and containers, monitoring instruments radios, clipboards, etc.) on the plastic drop cloth/sheet or in different containers with plastic liners. Each will be contaminated to a different degree. Segregation at the drop reduces the probability of cross contamination. Loose leaf sampling data sheets or maps can be placed in plastic zip lock bags if contamination is evident.

Station 2: Physical Removal With A High-Pressure Washer (Optional)

Use high pressure wash on grossly contaminated equipment. Do not use high- pressure wash on sensitive or non-waterproof equipment.

Station 3: Physical Removal With Brushes And A Wash Basin

Scrub equipment with soap and water using bottle and bristle brushes. Only sensitive equipment (i.e., radios, air monitoring and sampling equipment) which is waterproof should be washed. Equipment which is not waterproof should have plastic bags removed and wiped down with a damp cloth. Acids and organic rinses may also ruin sensitive equipment. Consult the manufacturers for recommended decontamination solutions.

Station 4: Equipment Rinse

Wash soap off of equipment with water by immersing the equipment in the water while brushing. Repeat as many times as necessary.

Station 5: Low-Pressure Rinse

Rinse sampling equipment with distilled/deionized water with a low-pressure sprayer.

Station 6: Nitric Acid Sprayers (required only if metals are a contaminant of concern)

Using a spray bottle rinse sampling equipment with nitric acid. Begin spraying (inside and outside) at one end of the equipment allowing the acid to drip to the other end into a 5-gallon bucket. A rinsate blank may be required at this station. Refer to Section 9.

Station 7: Low-Pressure Sprayers

Rinse sampling equipment with distilled/deionized water with a low-pressure sprayer.

Station 8: Organic Solvent Sprayers

Rinse sampling equipment with a solvent. Begin spraying (inside and outside) at one end of the equipment allowing the solvent to drip to the other end into a 5-gallon bucket. Allow the solvent to evaporate from the equipment before going to the next station. A QC rinsate sample may be required at this station.

Station 9: Low-Pressure Sprayers

Rinse sampling equipment with distilled/deionized water with a low-pressure washer.

Station 10: Clean Equipment Drop

Lay clean equipment on plastic sheeting. Once air dried, wrap sampling equipment with aluminum foil, plastic, or other protective material.

7.2.3 Post Decontamination Procedures

1. Collect high-pressure pad and heavy equipment decontamination area liquid and waste and store in appropriate drum or container. A sump pump can aid in the collection process. Refer to the Department of Transportation (DOT) requirements for appropriate containers based on the contaminant of concern.
2. Collect high-pressure pad and heavy equipment decontamination area solid waste and store in appropriate drum or container. Refer to the DOT requirements for appropriate containers based on the contaminant of concern.
3. Empty soap and water liquid wastes from basins and buckets and store in appropriate

drum or container. Refer to the DOT requirements for appropriate containers based on the contaminant of concern.

4. Empty acid rinse waste and place in appropriate container or neutralize with a base and place in appropriate drum. pH paper or an equivalent pH test is required for neutralization. Consult DOT requirements for appropriate drum for acid rinse waste.
5. Empty solvent rinse sprayer and solvent waste into an appropriate container. Consult DOT requirements for appropriate drum for solvent rinse waste.
6. Using low-pressure sprayers, rinse basins, and brushes. Place liquid generated from this process into the wash water rinse container.
7. Empty low-pressure sprayer water onto the ground.
8. Place all solid waste materials generated from the decontamination area (i.e., gloves and plastic sheeting, etc.) in an approved DOT drum. Refer to the DOT requirements for appropriate containers based on the contaminant of concern.
9. Write appropriate labels for waste and make arrangements for disposal. Consult DOT regulations for the appropriate label for each drum generated from the decontamination process.

8.0 CALCULATIONS

This section is not applicable to this SOP.

9.0 QUALITY ASSURANCE/ QUALITY CONTROL

A rinsate blank is one specific type of quality control sample associated with the field decontamination process. This sample will provide information on the effectiveness of the decontamination process employed in the field.

Rinsate blanks are samples obtained by running analyte free water over decontaminated sampling

equipment to test for residual contamination. The blank water is collected in sample containers for handling, shipment, and analysis. These samples are treated identical to samples collected that day. A rinsate blank is used to assess cross contamination brought about by improper decontamination procedures. Where dedicated sampling equipment is not utilized, collect one rinsate blank per day per type of sampling device samples to meet QA2 and QA3 objectives.

If sampling equipment requires the use of plastic tubing it should be disposed of as contaminated and replaced with clean tubing before additional sampling occurs.

10.0 DATA VALIDATION

Results of quality control samples will be evaluated for contamination. This information will be utilized to qualify the environmental sample results in accordance with the project's data quality objectives.

11.0 HEALTH AND SAFETY

When working with potentially hazardous materials, follow OSHA, U.S. EPA, corporate, and other applicable health and safety procedures.

Decontamination can pose hazards under certain circumstances. Hazardous substances may be incompatible with decontamination materials. For example, the decontamination solution may react with contaminants to produce heat, explosion, or toxic products. Also, vapors from decontamination solutions may pose a direct health hazard to workers by inhalation, contact, fire, or explosion.

The decontamination solutions must be determined to be acceptable before use. Decontamination materials may degrade protective clothing or equipment; some solvents can permeate protective clothing. If decontamination materials do pose a health hazard, measures should be taken to protect personnel or substitutions should be made to eliminate the hazard. The choice of respiratory protection based on contaminants of concern from the site may not be appropriate for solvents used in the decontamination process.

Safety considerations should be addressed when using abrasive and non-abrasive decontamination

equipment. Maximum air pressure produced by abrasive equipment could cause physical injury. Displaced material requires control mechanisms.

Material generated from decontamination activities requires proper handling, storage, and disposal. Personal Protective Equipment may be required for these activities.

Material safety data sheets are required for all decontamination solvents or solutions as required by the Hazard Communication Standard (i.e., acetone, alcohol, and trisodiumphosphate).

In some jurisdictions, phosphate containing detergents (i.e., TSP) are banned.

12.0 REFERENCES

Field Sampling Procedures Manual, New Jersey Department of Environmental Protection, February, 1988.

A Compendium of Superfund Field Operations Methods, EPA 540/p-87/001.

Engineering Support Branch Standard Operating Procedures and Quality Assurance Manual, USEPA Region IV, April 1, 1986.

Guidelines for the Selection of Chemical Protective Clothing, Volume 1, Third Edition, American Conference of Governmental Industrial Hygienists, Inc., February, 1987.

Occupational Safety and Health Guidance Manual for Hazardous Waste Site Activities, NIOSH/OSHA/USCG/EPA, October, 1985.

APPENDIX A

Table

Table 1. Soluble Contaminants and Recommended Solvent Rinse

TABLE 1 Soluble Contaminants and Recommended Solvent Rinse		
SOLVENT ⁽¹⁾	EXAMPLES OF SOLVENTS	SOLUBLE CONTAMINANTS
Water	Deionized water Tap water	Low-chain hydrocarbons Inorganic compounds Salts Some organic acids and other polar compounds
Dilute Acids	Nitric acid Acetic acid Boric acid	Basic (caustic) compounds (e.g., amines and hydrazines)
Dilute Bases	Sodium bicarbonate (e.g., soap detergent)	Acidic compounds Phenol Thiols Some nitro and sulfonic compounds
Organic Solvents ⁽²⁾	Alcohols Ethers Ketones Aromatics Straight chain alkalines (e.g., hexane) Common petroleum products (e.g., fuel, oil, kerosene)	Nonpolar compounds (e.g., some organic compounds)
Organic Solvent ⁽²⁾	Hexane	PCBs

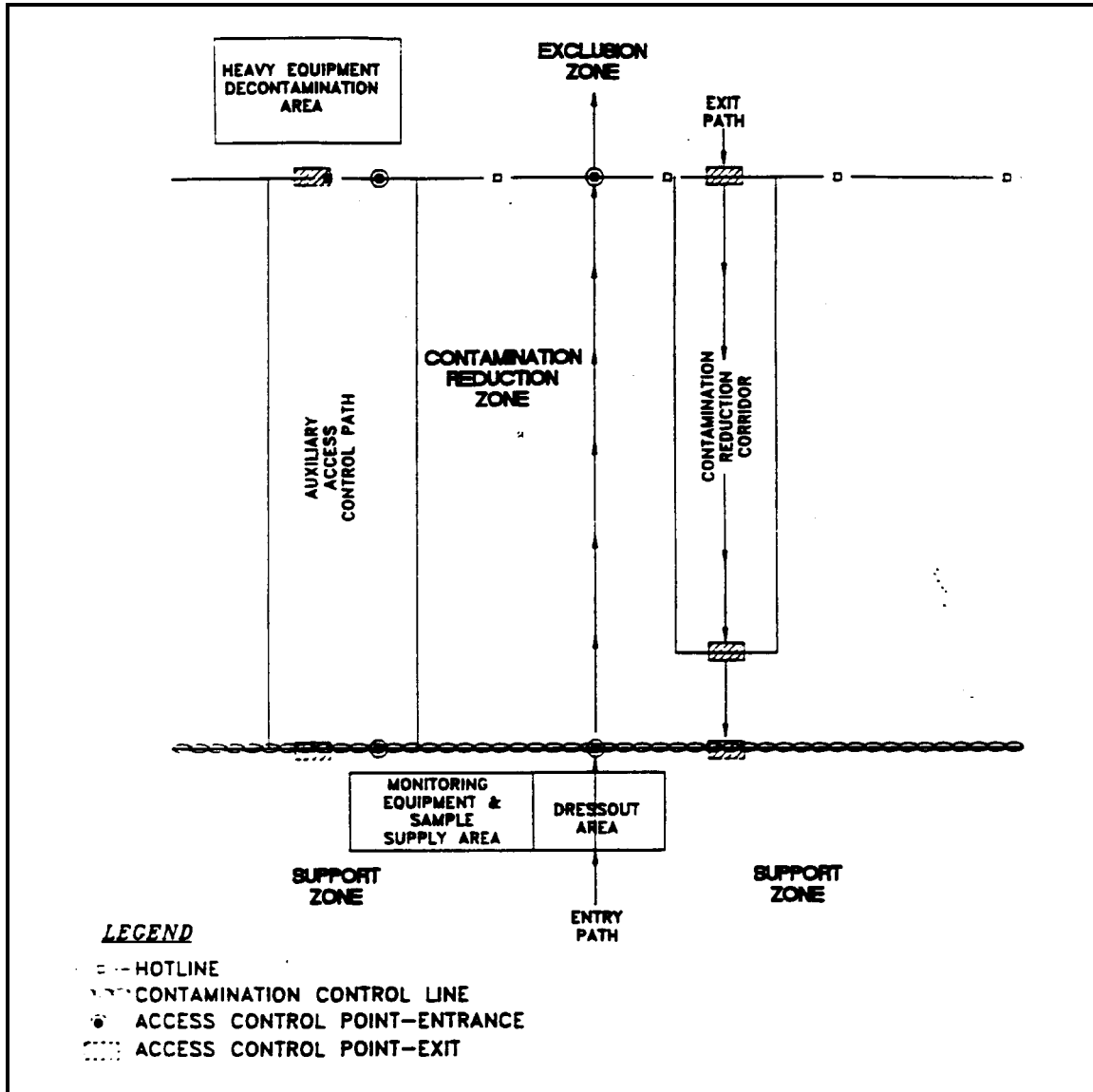
⁽¹⁾ - Material safety data sheets are required for all decontamination solvents or solutions as required by the Hazard Communication Standard

⁽²⁾ - WARNING: Some organic solvents can permeate and/or degrade the protective clothing

APPENDIX B

Figures

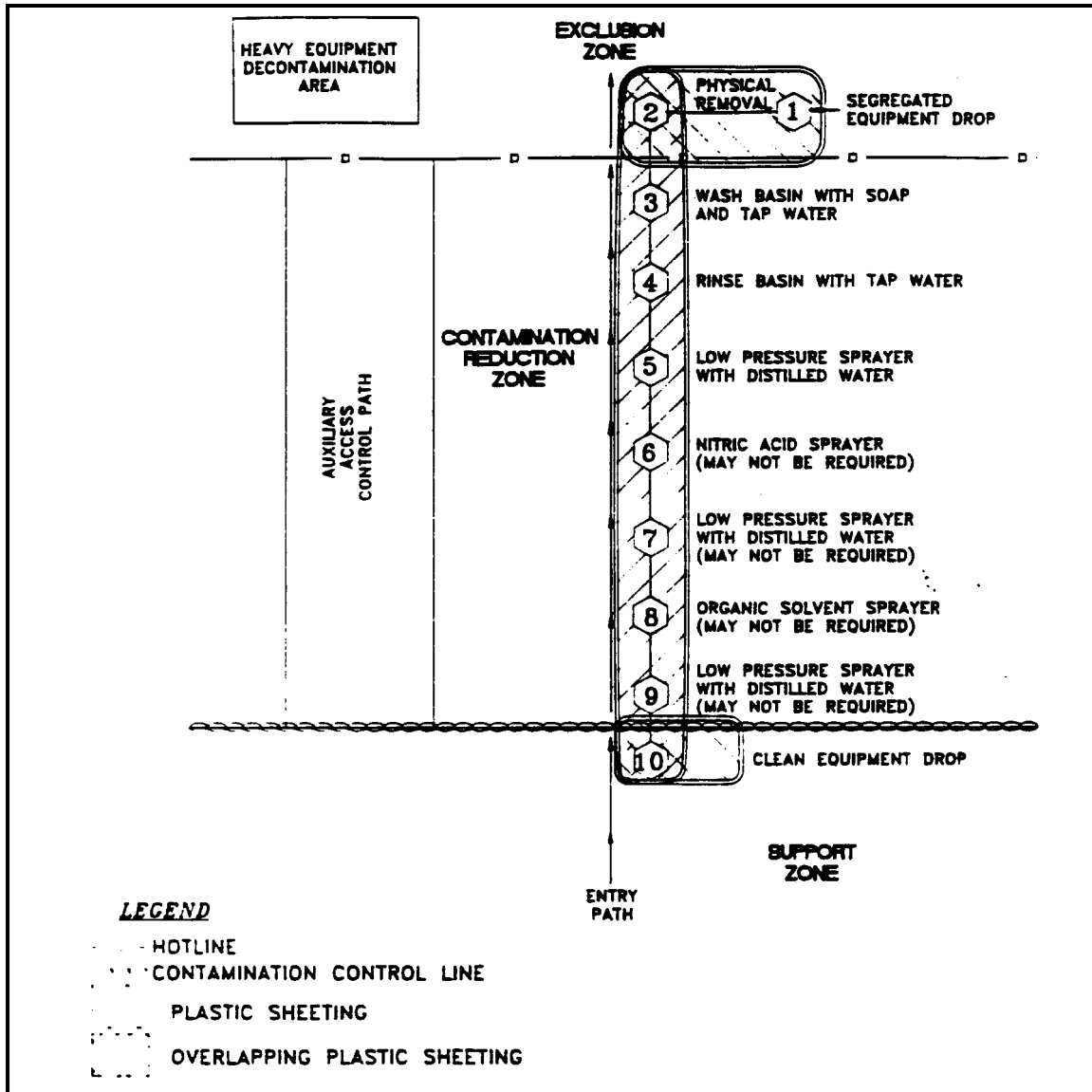
Figure 1. Contamination Reduction Zone Layout



APPENDIX B (Cont'd.)

Figures

Figure 2. Decontamination Layout





U. S. EPA ENVIRONMENTAL RESPONSE TEAM

STANDARD OPERATING PROCEDURES

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SOIL SAMPLING

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SOIL SAMPLING

1.0 SCOPE AND APPLICATION

The purpose of this standard operating procedure (SOP) is to describe the procedures for the collection of representative soil samples. Sampling depths are assumed to be those that can be reached without the use of a drill rig, direct-push, or other mechanized equipment (except for a back-hoe). Analysis of soil samples may determine whether concentrations of specific pollutants exceed established action levels, or if the concentrations of pollutants present a risk to public health, welfare, or the environment.

These are standard (i.e., typically applicable) operating procedures which may be varied or changed as required, dependent upon site conditions, equipment limitations or limitations imposed by the procedure. In all instances, the actual procedures used should be documented and described in an appropriate site report.

Mention of trade names or commercial products does not constitute U.S. Environmental Protection Agency (EPA) endorsement or recommendation for use.

2.0 METHOD SUMMARY

Soil samples may be collected using a variety of methods and equipment depending on the depth of the desired sample, the type of sample required (disturbed vs. undisturbed), and the soil type. Near-surface soils may be easily sampled using a spade, trowel, and scoop. Sampling at greater depths may be performed using a hand auger, continuous flight auger, a trier, a split-spoon, or, if required, a backhoe.

3.0 SAMPLE PRESERVATION, CONTAINERS, HANDLING, AND STORAGE

Chemical preservation of solids is not generally recommended. Samples should, however, be cooled and protected from sunlight to minimize any potential reaction. The amount of sample to be collected and proper sample container type are discussed in ERT/REAC SOP #2003 Rev. 0.0 08/11/94, *Sample Storage, Preservation and Handling*.

4.0 INTERFERENCES AND POTENTIAL PROBLEMS

There are two primary potential problems associated with soil sampling - cross contamination of samples and improper sample collection. Cross contamination problems can be eliminated or minimized through the use of dedicated sampling equipment. If this is not possible or practical, then decontamination of sampling equipment is necessary. Improper sample collection can involve using contaminated equipment, disturbance of the matrix resulting in compaction of the sample, or inadequate homogenization of the samples where required, resulting in variable, non-representative results.

5.0 EQUIPMENT



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Soil sampling equipment includes the following:

- Maps/plot plan
- Safety equipment, as specified in the site-specific Health and Safety Plan
- Survey equipment or global positioning system (GPS) to locate sampling points
- Tape measure
- Survey stakes or flags
- Camera and film
- Stainless steel, plastic, or other appropriate homogenization bucket, bowl or pan
- Appropriate size sample containers
- Ziplock plastic bags
- Logbook
- Labels
- Chain of Custody records and custody seals
- Field data sheets and sample labels
- Cooler(s)
- Ice
- Vermiculite
- Decontamination supplies/equipment
- Canvas or plastic sheet
- Spade or shovel
- Spatula
- Scoop
- Plastic or stainless steel spoons
- Trowel(s)
- Continuous flight (screw) auger
- Bucket auger
- Post hole auger
- Extension rods
- T-handle
- Sampling trier
- Thin wall tube sampler
- Split spoons
- Vehimeyer soil sampler outfit
 - Tubes
 - Points
 - Drive head
 - Drop hammer
 - Puller jack and grip
- Backhoe



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Reagents are not used for the preservation of soil samples. Decontamination solutions are specified in ERT/REAC SOP #2006 Rev. 0.0 08/11/94, *Sampling Equipment Decontamination*, and the site specific work plan.

7.0 PROCEDURES

7.1 Preparation

1. Determine the extent of the sampling effort, the sampling methods to be employed, and the types and amounts of equipment and supplies required.
2. Obtain necessary sampling and monitoring equipment.
3. Decontaminate or pre-clean equipment, and ensure that it is in working order.
4. Prepare schedules and coordinate with staff, client, and regulatory agencies, if appropriate.
5. Perform a general site survey prior to site entry in accordance with the site specific Health and Safety Plan.
6. Use stakes, flagging, or buoys to identify and mark all sampling locations. Specific site factors, including extent and nature of contaminant, should be considered when selecting sample location. If required, the proposed locations may be adjusted based on site access, property boundaries, and surface obstructions. All staked locations should be utility-cleared by the property owner or the On-Scene-Coordinator (OSC) prior to soil sampling; and utility clearance should always be confirmed before beginning work.

7.2 Sample Collection

7.2.1 Surface Soil Samples

Collection of samples from near-surface soil can be accomplished with tools such as spades, shovels, trowels, and scoops. Surface material is removed to the required depth and a stainless steel or plastic scoop is then used to collect the sample.

This method can be used in most soil types but is limited to sampling at or near the ground surface. Accurate, representative samples can be collected with this procedure depending on the care and precision demonstrated by the sample team member. A flat, pointed mason trowel to cut a block of the desired soil is helpful when undisturbed profiles are required. Tools plated with chrome or other materials should not be used. Plating is particularly common with garden implements such as potting trowels.

The following procedure is used to collect surface soil samples:



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1. Carefully remove the top layer of soil or debris to the desired sample depth with a pre-cleaned spade.
2. Using a pre-cleaned, stainless steel scoop, plastic spoon, or trowel, remove and discard a thin layer of soil from the area which came in contact with the spade.
3. If volatile organic analysis is to be performed, transfer the sample directly into an appropriate, labeled sample container with a stainless steel lab spoon, or equivalent and secure the cap tightly. Place the remainder of the sample into a stainless steel, plastic, or other appropriate homogenization container, and mix thoroughly to obtain a homogenous sample representative of the entire sampling interval. Then, either place the sample into appropriate, labeled containers and secure the caps tightly; or, if composite samples are to be collected, place a sample from another sampling interval or location into the homogenization container and mix thoroughly. When compositing is complete, place the sample into appropriate, labeled containers and secure the caps tightly.

7.2.2 Sampling at Depth with Augers and Thin Wall Tube Samplers

This system consists of an auger, or a thin-wall tube sampler, a series of extensions, and a "T" handle (Figure 1, Appendix A). The auger is used to bore a hole to a desired sampling depth, and is then withdrawn. The sample may be collected directly from the auger. If a core sample is to be collected, the auger tip is then replaced with a thin wall tube sampler. The system is then lowered down the borehole, and driven into the soil to the completion depth. The system is withdrawn and the core is collected from the thin wall tube sampler.

Several types of augers are available; these include: bucket type, continuous flight (screw), and post-hole augers. Bucket type augers are better for direct sample recovery because they provide a large volume of sample in a short time. When continuous flight augers are used, the sample can be collected directly from the flights. The continuous flight augers are satisfactory when a composite of the complete soil column is desired. Post-hole augers have limited utility for sample collection as they are designed to cut through fibrous, rooted, swampy soil and cannot be used below a depth of approximately three feet.

The following procedure is used for collecting soil samples with the auger:

1. Attach the auger bit to a drill rod extension, and attach the "T" handle to the drill rod.



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2. Clear the area to be sampled of any surface debris (e.g., twigs, rocks, litter). It may be advisable to remove the first three to six inches of surface soil for an area approximately six inches in radius around the drilling location.
3. Begin augering, periodically removing and depositing accumulated soils onto a plastic sheet spread near the hole. This prevents accidental brushing of loose material back down the borehole when removing the auger or adding drill rods. It also facilitates refilling the hole, and avoids possible contamination of the surrounding area.
4. After reaching the desired depth, slowly and carefully remove the auger from the hole. When sampling directly from the auger, collect the sample after the auger is removed from the hole and proceed to Step 10.
5. Remove auger tip from the extension rods and replace with a pre-cleaned thin wall tube sampler. Install the proper cutting tip.
6. Carefully lower the tube sampler down the borehole. Gradually force the tube sampler into the soil. Do not scrape the borehole sides. Avoid hammering the rods as the vibrations may cause the boring walls to collapse.
7. Remove the tube sampler, and unscrew the drill rods.
8. Remove the cutting tip and the core from the device.
9. Discard the top of the core (approximately 1 inch), as this possibly represents material collected before penetration of the layer of concern. Place the remaining core into the appropriate labeled sample container. Sample homogenization is not required.
10. If volatile organic analysis is to be performed, transfer the sample into an appropriate, labeled sample container with a stainless steel lab spoon, or equivalent and secure the cap tightly. Place the remainder of the sample into a stainless steel, plastic, or other appropriate homogenization container, and mix thoroughly to obtain a homogenous sample representative of the entire sampling interval. Then, either place the sample into appropriate, labeled containers and secure the caps tightly; or, if composite samples are to be collected, place a sample from another sampling interval into the homogenization container and mix thoroughly.

When compositing is complete, place the sample into appropriate, labeled containers and secure the caps tightly.



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11. If another sample is to be collected in the same hole, but at a greater depth, reattach the auger bit to the drill and assembly, and follow steps 3 through 11, making sure to decontaminate the auger and tube sampler between samples.
12. Abandon the hole according to applicable state regulations. Generally, shallow holes can simply be backfilled with the removed soil material.

7.2.3 Sampling with a Trier

The system consists of a trier, and a "T" handle. The auger is driven into the soil to be sampled and used to extract a core sample from the appropriate depth.

The following procedure is used to collect soil samples with a sampling trier:

1. Insert the trier (Figure 2, Appendix A) into the material to be sampled at a 0° to 45° angle from horizontal. This orientation minimizes the spillage of sample.
2. Rotate the trier once or twice to cut a core of material.
3. Slowly withdraw the trier, making sure that the slot is facing upward.
4. If volatile organic analyses are required, transfer the sample into an appropriate, labeled sample container with a stainless steel lab spoon, or equivalent and secure the cap tightly. Place the remainder of the sample into a stainless steel, plastic, or other appropriate homogenization container, and mix thoroughly to obtain a homogenous sample representative of the entire sampling interval. Then, either place the sample into appropriate, labeled containers and secure the caps tightly; or, if composite samples are to be collected, place a sample from another sampling interval into the homogenization container and mix thoroughly. When compositing is complete, place the sample into appropriate, labeled containers and secure the caps tightly.

7.2.4 Sampling at Depth with a Split Spoon (Barrel) Sampler

Split spoon sampling is generally used to collect undisturbed soil cores of 18 or 24 inches in length. A series of consecutive cores may be extracted with a split spoon sampler to give a complete soil column profile, or an auger may be used to drill down to the desired depth for sampling. The split spoon is then driven to its sampling depth through the bottom of the augured hole and the core extracted.

When split spoon sampling is performed to gain geologic information, all work should



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be performed in accordance with ASTM D1586-98, "Standard Test Method for Penetration Test and Split-Barrel Sampling of Soils".

The following procedures are used for collecting soil samples with a split spoon:

1. Assemble the sampler by aligning both sides of barrel and then screwing the drive shoe on the bottom and the head piece on top.
2. Place the sampler in a perpendicular position on the sample material.
3. Using a well ring, drive the tube. Do not drive past the bottom of the head piece or compression of the sample will result.
4. Record in the site logbook or on field data sheets the length of the tube used to penetrate the material being sampled, and the number of blows required to obtain this depth.
5. Withdraw the sampler, and open by unscrewing the bit and head and splitting the barrel. The amount of recovery and soil type should be recorded on the boring log. If a split sample is desired, a cleaned, stainless steel knife should be used to divide the tube contents in half, longitudinally. This sampler is typically available in 2 and 3 1/2 inch diameters. A larger barrel may be necessary to obtain the required sample volume.
6. Without disturbing the core, transfer it to appropriate labeled sample container(s) and seal tightly.

7.2.5 Test Pit/Trench Excavation

A backhoe can be used to remove sections of soil, when detailed examination of soil characteristics are required. This is probably the most expensive sampling method because of the relatively high cost of backhoe operation.

The following procedures are used for collecting soil samples from test pits or trenches:

1. Prior to any excavation with a backhoe, it is important to ensure that all sampling locations are clear of overhead and buried utilities.
2. Review the site specific Health & Safety plan and ensure that all safety precautions including appropriate monitoring equipment are installed as required.



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3. Using the backhoe, excavate a trench approximately three feet wide and approximately one foot deep below the cleared sampling location. Place excavated soils on plastic sheets. Trenches greater than five feet deep must be sloped or protected by a shoring system, as required by OSHA regulations.
4. A shovel is used to remove a one to two inch layer of soil from the vertical face of the pit where sampling is to be done.
5. Samples are taken using a trowel, scoop, or coring device at the desired intervals. Be sure to scrape the vertical face at the point of sampling to remove any soil that may have fallen from above, and to expose fresh soil for sampling. In many instances, samples can be collected directly from the backhoe bucket.
6. If volatile organic analyses are required, transfer the sample into an appropriate, labeled sample container with a stainless steel lab spoon, or equivalent and secure the cap tightly. Place the remainder of the sample into a stainless steel, plastic, or other appropriate homogenization container, and mix thoroughly to obtain a homogenous sample representative of the entire sampling interval. Then, either place the sample into appropriate, labeled containers and secure the caps tightly; or, if composite samples are to be collected, place a sample from another sampling interval into the homogenization container and mix thoroughly. When compositing is complete, place the sample into appropriate, labeled containers and secure the caps tightly.
7. Abandon the pit or excavation according to applicable state regulations. Generally, shallow excavations can simply be backfilled with the removed soil material.

8.0 CALCULATIONS

This section is not applicable to this SOP.

9.0 QUALITY ASSURANCE/QUALITY CONTROL

There are no specific quality assurance (QA) activities which apply to the implementation of these procedures. However, the following QA procedures apply:

1. All data must be documented on field data sheets or within site logbooks.
2. All instrumentation must be operated in accordance with operating instructions as supplied by the manufacturer, unless otherwise specified in the work plan. Equipment checkout and calibration



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activities must occur prior to sampling/operation, and they must be documented.

10.0 DATA VALIDATION

This section is not applicable to this SOP.

11.0 HEALTH AND SAFETY

When working with potentially hazardous materials, follow U.S. EPA, OHSA and corporate health and safety procedures, in addition to the procedures specified in the site specific Health & Safety Plan..

12.0 REFERENCES

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Barth, D.S. and B.J. Mason. 1984. Soil Sampling Quality Assurance User's Guide. EPA-600/4-84-043.

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Figures
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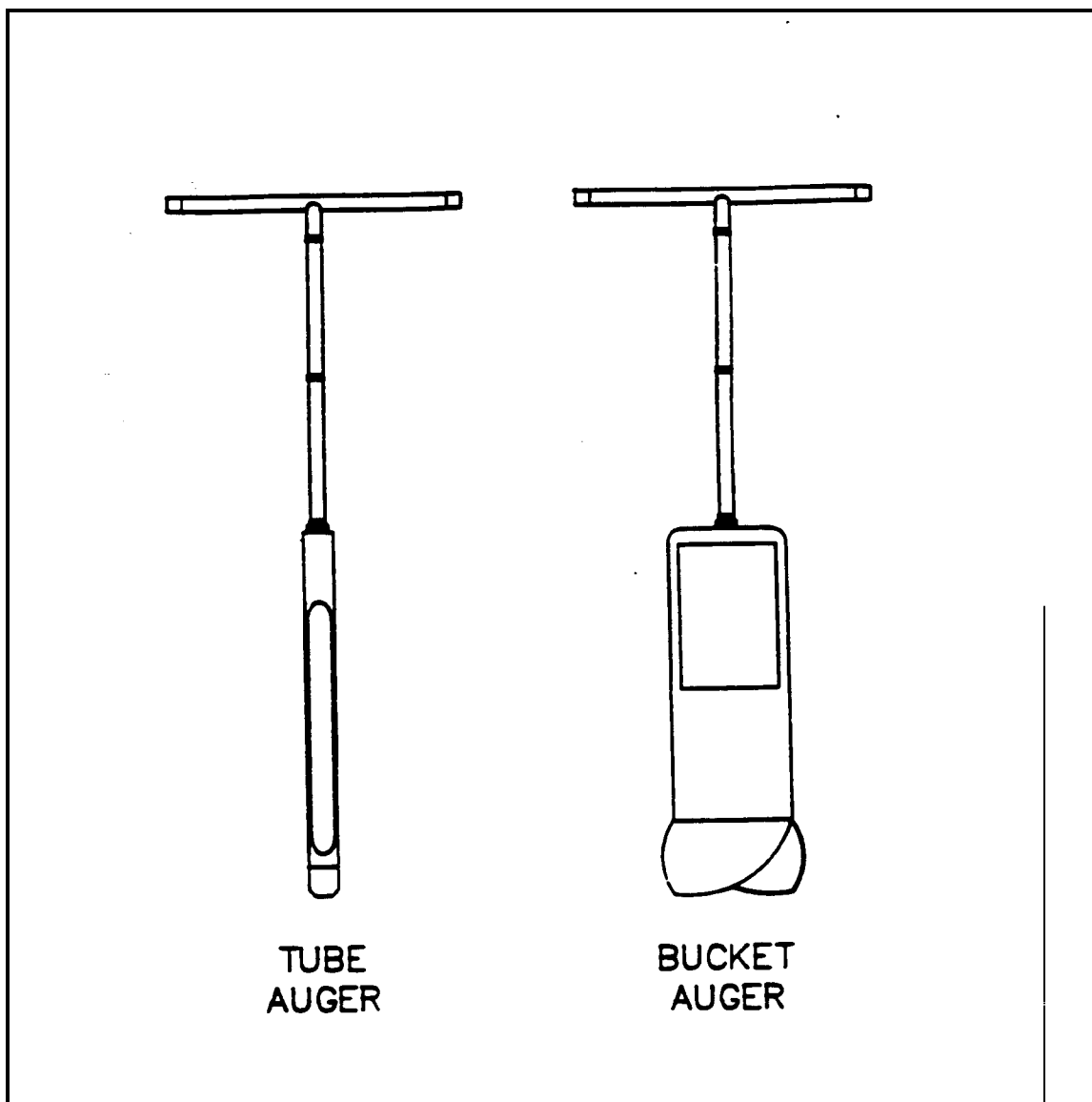
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FIGURE 1. Sampling Augers





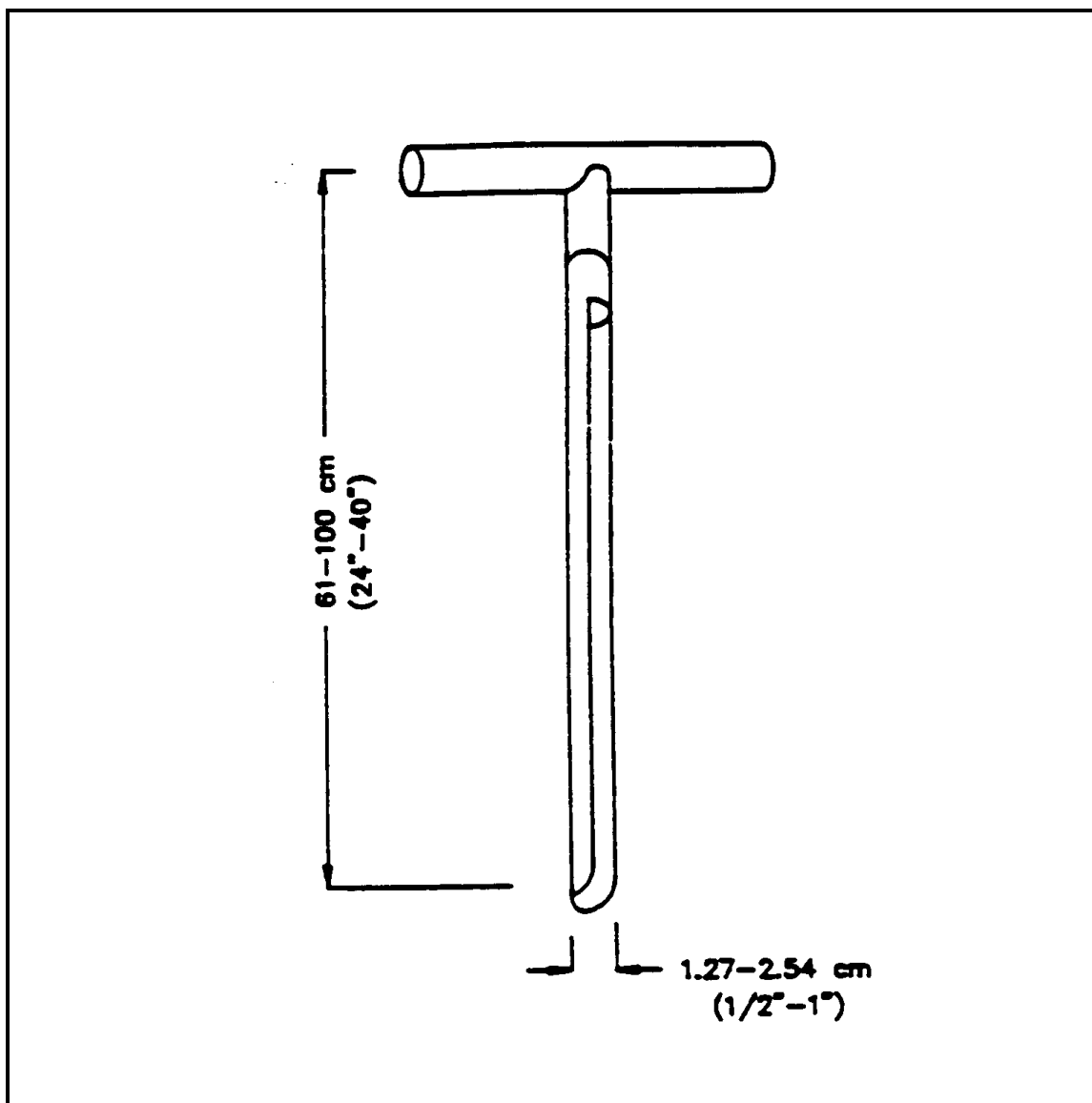
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FIGURE 2. Sampling Trier



ATTACHMENT 2: Analytical Services SOP

EPA Region 2 Laboratory SOP# C-109



STANDARD OPERATING PROCEDURE

DETERMINATION OF METALS IN AQUEOUS, TCLP EXTRACTS, SOIL/SEDIMENT, SLUDGE, AND BIOLOGICAL TISSUE SAMPLES BY INDUCTIVELY COUPLED PLASMA-ATOMIC EMISSION SPECTROMETRY

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U.S. ENVIRONMENTAL PROTECTION AGENCY
REGION 2
DIVISION OF ENVIRONMENTAL SCIENCE AND ASSESSMENT
LABORATORY BRANCH

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Table(s):

Table 1	Standard Solutions Preparation
Table 2	ICP-AES - Reporting Limits - Aqueous and Solid (Soil/Sediment/Sludge)

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STANDARD OPERATING PROCEDURE

DETERMINATION OF METALS IN AQUEOUS, TCLP EXTRACT, SOIL/SEDIMENT, SLUDGE, AND BIOLOGICAL TISSUE MATRICES BY INDUCTIVELY COUPLED PLASMA-ATOMIC EMISSION SPECTROMETRY

1. Scope and Application

- 1.1 This SOP is applicable to the analysis of environmental samples, including aqueous, TCLP extract, soil/sediment, sludge, biological tissue, and, for the determination of the following metals:

Ag, Al, As, B, Ba, Be, Ca, Cd, Co, Cr, Cu, Fe, K, Mg, Mn, Mo, Na, Ni, Pb, Sb, Se, Si, Sn, Sr, Ti, Tl, V, and Zn

B, Sn, Si and Sr are optional for analysis by iCAP 6300.

This SOP is not applicable to the preparation and analysis of drinking water compliance monitoring samples. The procedure for the preparation and analysis of drinking water compliance monitoring samples by ICP-AES is detailed in Laboratory SOP #DW-5.

Waste oil and organic solvents may be analyzed by this method following a suitable sample preparation procedure.

- 1.2 The standard reporting limits for both aqueous and non-aqueous samples are listed in Table 2.
- 1.3 This SOP is based on EPA Method 200.7, Revision 4.4.

2. Summary of Method

- 2.1 Environmental samples, e.g., aqueous, TCLP extracts, soil/sediment, sludges and biological tissue, are digested in a mixture of acids, according to the procedures described in, SOP #C-116 "Preparation of Aqueous, TCLP Extracts, Soil/Sediment/Sludge, and Biological Tissue Matrices by Block Digestion".
- 2.2 The analysis described in this method involves multi-element determinations by ICP-AES using the Thermo IRIS Intrepid II ICP or the Thermo iCAP 6300 Duo. These instruments measure characteristic atomic-line emission spectra by optical spectrometry. Samples are nebulized and the resulting aerosol is transported to the plasma torch. Element specific emission spectra are produced by a radio-frequency inductively coupled argon plasma. The spectra are dispersed and the intensities of the line spectra are monitored at specific

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wavelengths using a Charge Injection Device (CID). The output from the detector is processed and controlled by a computer system.

A background correction technique is required to compensate for background contribution to the determination of the analytes. Background must be measured adjacent to the analyte wavelength during analysis. Various interferences must be considered and addressed appropriately.

3. Definitions

See **SOP #G-15** for definitions.

4. Interferences

4.1 Several types of interference effects may contribute to inaccuracies in the determination of trace elements. They can be summarized as follows:

4.1.1 Spectral Interferences can be categorized as

- 1) overlap of a spectral line from another element;
- 2) unresolved overlap of molecular band spectra;
- 3) background contribution from continuous or recombination phenomena; and
- 4) background contribution from stray light from the line emission of high concentration elements.

The first of these effects can be compensated for by utilizing a computer correction of the raw data, requiring the monitoring and measurement of the interfering element. The second effect may require selection of an alternate wavelength. The third and fourth effects can usually be compensated for by a background correction adjacent to the analyte line. In addition, users of simultaneous multi element instrumentation must assume the responsibility of verifying the absence of spectral interference from an element that could occur in a sample but for which there is no channel in the instrument array. For this purpose, linear relationships between concentration and intensity for the analytes and the interferences must be demonstrated over the range of interest.

4.1.2 Physical Interferences are generally considered to be effects associated with the sample nebulization and transport processes. Such properties as change in viscosity and surface tension can cause significant inaccuracies especially in samples which may contain high dissolved solids and/or acid concentrations. The use of a peristaltic pump may lessen these interferences. If these types of interferences are operative, they must be reduced by

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dilution of the sample. Another problem which can occur from high dissolved solids is salt buildup at the tip of the nebulizer. This affects aerosol flow-rate causing instrumental drift. Wetting the argon prior to nebulization, the use of a tip washer, or sample dilution have been used to control this problem. This problem can also be alleviated by using a Bergener nebulizer instead of a Meinhardt nebulizer. Also, it has been reported that better control of the argon flow rate improves instrument performance. This is accomplished with the use of mass flow controllers.

4.1.3 Chemical Interferences are characterized by molecular compound formation, ionization effects and solute vaporization effects. Normally these effects are not pronounced with the ICP technique. If observed, they can be minimized by careful selection of operating conditions (that is, incident power, observation position, and so forth), buffering of the sample and matrix matching. These types of interferences can be highly dependent on matrix type and specific analyte element.

4.2 Generally, whenever a new or unusual sample matrix is encountered, a series of tests on the matrix-type are performed, e.g., background check of the sample, sample overlay with standards, etc., prior to analyzing samples associated with that matrix. If the problems associated with the new matrix cannot be overcome, the sample must either be diluted appropriately (and the Reporting Limit raised accordingly) or analyzed by an acceptable alternative method.

5. Safety

- 5.1 The toxicity and carcinogenicity of each reagent used in this method has not been fully established. Each chemical should be regarded as a potential health hazard and exposure to these compounds should be minimized by good laboratory practices, e.g. wear proper protective equipment, safety glasses, gloves, lab coat and working inside hoods whenever possible.
- 5.2 Refer to the Edison Facility Safety Manual Region II Part 2 – Laboratory Safety and Appendices 13/13A - Chemical Hygiene Plan for specific guidelines. The manual is available on the Region II Intranet. A hard copy is available in the Laboratory Office area.
- 5.3 For detailed explanations consult the Material Safety Data Sheets (MSDS), available in the Laboratory Office area. MSDS are also electronically available.

6. Apparatus and Material

- 6.1. Inductively Coupled Argon Plasma Spectrometer:
 - 6.1.1 Thermo IRIS Intrepid II or Thermo iCAP 6300 Duo, each computer controlled and equipped with a radio frequency generator and a variable speed peristaltic pump which is

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used to deliver both standards and samples to the nebulizer.

- 6.1.2 High purity (99.99%) liquid argon.
- 6.1.3 Computer controlled mass flow controllers which regulate the argon flow rates.
- 6.1.4 Autosampler, - as supplied by Thermo, Cetac or equivalent.
- 6.2. Balance which has the capability to measure to at least 0.01g.
- 6.3 Calibrated automatic pipets with disposable tips.
- 6.4. Miscellaneous laboratory glassware and plastic ware.

7. Reagents and Solutions

All purchased and prepared standards and reagents are recorded in Element which assigns a unique ID# to each. All containers must be labeled with the Name, ID#, concentration, preparation date and expiration date (where applicable). See SOP # G-9 for details.

- 7.1 Reagents - All reagents must be of high purity and suitable for trace metals analysis.
 - 7.1.1 Hydrochloric acid, concentrated - HCl (GFS HCl, 36 - 38% Reagent ACS or equivalent)
 - 7.1.2 Nitric acid, concentrated - HNO₃ (GFS HNO₃, Redistilled or equivalent)
 - 7.1.3 Reagent grade water - ASTM Type I Water
- 7.2 Purchased standard solutions may be used until the expiration date given by the manufacturer or until three years after being opened if no date is given. Prepared solutions may be used for one year from date of preparation unless a shorter time is specified. Refer to Table 1 for standard solutions preparations summary. Solutions are prepared using 2% HNO₃ and 5% HCl.
 - 7.2.1 Calibration Stock Standard Solutions - Claritas Custom Standards manufactured by Spex CertiPrep or equivalent. These solutions are usually used with the IRIS Intrepid II:
 - 7.2.1.1 Calibration Standard 1 - SPEX CertiPrep Custom Claritas Standard (250 ppm of Ag, As, B, Ba, Be, Cd, Co, Cr, Cu, Mn, Mo, Ni, Pb, Sb, Se, Sn, Sr, Ti, Tl, V, and Zn) or equivalent.
 - 7.2.1.2 Calibration Standard 2 - SPEX CertiPrep Custom Claritas Standard (250 ppm of Al, Ca, Fe, Mg, K, Na and Si) or equivalent.

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7.2.2 Calibration Stock Standard Solutions - The following solutions, available from Absolute Standards or equivalent, are usually used with the iCAP 6300:

- 7.2.2.1 Calibration Stock A - Absolute ICP Mix 1 (500 ppm) – 17 custom mixed analytes containing As, Ba, Be, Cd, Co, Cr, Cu, Mn, Mo, Ni, Pb, Sb, Se, Ti, TL, V and Zn.
- 7.2.2.2 Calibration Stock B – Absolute Metals Mix (5,000ppm) mixed salts containing Al, Ca, Fe, K, Mg and Na.
- 7.2.2.3 Calibration Stock C - Absolute Silver (1000 ppm) single analyte containing Ag only.

7.2.3 Single element standards for preparation of RL, 2RL (LCV's) and IEC (IFA) solutions. These may also be used to prepare Calibration Standards.

- 7.2.3.1 1,000 ppm Ag, As, B, Ba, Be, Cd, Co, Cr, Cu, Mn, Mo, Ni, Pb, Sb, Se, Sn, Sr, Ti, Tl, V, and Zn. Available from GFS, Absolute or equivalent.
- 7.2.3.2 10,000 ppm Al, Ca, Fe, Mg, K, Na and Si. Available from GFS, Absolute or equivalent.

7.2.4 Working Calibration Solutions

7.2.4.1 The IRIS usually utilizes:

High Standard	10,000 µg/L for Al, Ca, Fe, K, Mg, Na and Si 1,000 µg/L for elements Ag, As, B, Ba, Be, Cd, Co, Cr, Cu, Mn, Mo, Ni, Pb, Sb, Se, Sn, Sr, Ti, Tl, V, and Zn
Mid Standard	5,000 µg/L for Al, Ca, Fe, K, Mg, Na and Si 500 µg/L for elements Ag, As, B, Ba, Be, Cd, Co, Cr, Cu, Mn, Mo, Ni, Pb, Sb, Se, Sn, Sr, Ti, Tl, V, and Zn

A single mixed standard or any other suitable combinations of standards/concentrations/elements may also be used to standardize/calibrate the IRIS.

Solutions are prepared using 2% HNO₃ and 5% HCL.

7.2.4.2 The Thermo iCAP 6300 usually utilizes:

High Standard	10,000 µg/L for Al, Ca, Fe, K, Mg, Na, As, Ba, Be, Cd, Co, Cr, Cu, Mn, Mo, Ni, Pb, Sb, Se, Ti, Tl, V, Zn, and 1000 µg/L for Ag
Mid Standard	5,000 µg/L for Al, Ca, Fe, K, Mg, Na, As, Ba, Be, Cd, Co, Cr, Cu, Mn, Mo, Ni, Pb, Sb, Se, Ti, Tl, V, Zn, and 500 µg/L for Ag

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A single mixed standard or any other suitable combinations of standards/concentrations/elements may also be used to standardize/calibrate the iCAP 6300

B, Sn, Sr and Si are optional for analysis by iCAP 6300.

7.2.5 Blanks - Four types of blanks are required for the analysis:

- 7.2.5.1 The calibration blank is prepared by adding HNO₃ and HCl to reagent grade water to the same concentrations used for the calibration standard solution. This calibration blank is used in establishing the analytical curve.
- 7.2.5.2 The rinse blank is prepared by adding HNO₃ and HCl to reagent grade water to the same concentration as used in the calibration blank. A controlled flush time with the rinse blank solution is used to flush the instrument uptake system and nebulizer between /standards/check solutions/samples to reduce/eliminate memory and carryover interferences.
- 7.2.5.3 The initial calibration blank/continuing calibration blank (ICB and CCB) are prepared by adding HNO₃ and HCl to reagent grade water to the same concentration as used in the calibration blank. The ICB/CCB is run after the calibration check standards to assess carryover.
- 7.2.5.4 Laboratory Reagent Blank (LRB)/Prep Blank (PB/BLK) - must contain all the reagents in the same volumes as used in digesting the samples. The LRB/PB/BLK must be carried through the same preparation scheme as the samples including digestion, if applicable. The LRB/PB/BLK is used to assess possible contamination from the sample preparation procedure and spectral background.

7.2.6 Initial Calibration Verification/Continuing Calibration Verification Solution (ICV/CCV)
- These verification standard solutions are used to initially and periodically verify instrument performance during analysis. The ICV/CCV stocks must be obtained from a source different from the calibration stock standard solutions (different vendor or lot number) and prepared in the same acid mixture as the calibration standards.

- 7.2.6.1 IRIS - The concentration of the analytes in the ICV/CCV solution is usually 200 µg/L for elements: Ag, As, B, Ba, Be, Cd, Co, Cr, Cu, Mn, Mo, Ni, Pb, Sb, Se, Sn, Sr, Ti, Tl, V, Zn and 5,000 µg/L for minerals: Al, Ca, Fe, K, Mg, Na and Si. (The concentration of the ICV/CCV solution may be varied to accommodate special requirements for non routine projects. Acceptance criteria will remain the same.
 - 7.2.6.1.1 Claritas Custom Standard - ICV1, 250ppm (Ag, As, B, Ba, Be, Cd, Co, Cr, Cu, Mn, Mo, Ni, Pb, Sb, Se, Sn, Sr, Ti, Tl, V, and Zn) or equivalent
 - 7.2.6.1.2 Claritas Custom Standard - ICV2, 250ppm (Al, Ca, Fe, K, Mg, Na, Si) or

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equivalent.

7.2.6.2 iCAP 6300 - The concentration of the analytes in the ICV/CCV solution is usually 200 µg/L for elements: Ag, As, Ba, Be, Cd, Co, Cr, Cu, Mn, Mo, Ni, Pb, Sb, Se, Ti, Tl, V, Zn and 5,000 µg/L for minerals: Al, Ca, Fe, K, Mg, and Na.

7.2.6.2.1 Calibration Stock A - Absolute ICP Mix 1 (100 ppm) – 17 custom mixed analytes containing As, Ba, Be, Cd, Co, Cr, Cu, Mn, Mo, Ni, Pb, Sb, Se, Ti, Tl, V and Zn.

7.2.6.2.2 Calibration Stock B – Absolute Metals Mix (5,000ppm) mixed salts containing Al, Ca, Fe, K, Mg and Na.

7.2.6.2.3 Calibration Stock C - Absolute Silver (1000 ppm) single analyte containing Ag only.

7.2.6.2.4 B, Sn, Sr and Si are not usually included in analysis by iCAP 6300. When required, B, Sn and Sr are included in the ICV/CCV at 200 µg/L and Si at 5,000 µg/L.

7.2.7 Low Level Check (RL, 2RL/LCV) - The low level checks are used to initially and periodically verify instrument performance at lower concentration levels. The concentration of the analytes is set at the reporting limit (RL) and at twice the reporting limit (2RL) for each element.

7.2.8 Internal Standard Solutions - The normal calibration procedure for arc/spark involves the use of an internal standard. An element not found in the matrix being analyzed is added to each standard and each sample. Should the volume of aspirated sample change, a corresponding intensity change will occur for all elements. Since the ratio remains constant, the possible error is eliminated.

Dilute Internal Standard Stock Solutions (Yttrium and Cesium, each 10,000 ppm or equivalent) to the following concentrations using 2% HNO₃ and 5% HCl:

7.2.8.1 IRIS: - 10ppm Y

7.2.8.2 iCAP 6300 -: 2,000 ppm Cs, 5 ppm Y

7.2.9 Auto Peak Adjust - use the high standard solution and follow the Auto Peak Adjust command on the instrument.

7.2.10 Inter-Element Correction (IEC/IFA) Solution - When inter-element corrections are applied, a spectral interference check solution is needed which contains concentrations of the interfering elements at levels that will provide an adequate test of the correction factors. The IEC/IFA solution is prepared by diluting individual standard solutions: Al,

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Ca, Fe, Mg and Na, each 10,000 ppm, to a final concentration of 300 ppm with 2% HNO₃/5% HCl blank solution.

8. Sample Collection, Preservation, Storage and Holding Time

8.1 Sample Collection - Samples must be collected in plastic or glass containers.

8.2 Preservation and Storage

8.2.1 Aqueous samples - the samples are preserved using concentrated HNO₃. The preservation is performed either in the field at the time of collection, or in the Laboratory upon receipt (within five days). If the samples are preserved in the Laboratory, they must be held for sixteen hours after acidification and then verified to a pH <2 prior to sample processing. If the sample pH is verified to be pH >2 after the sixteen hours, additional HNO₃ must be added and the sample held for an additional sixteen hours until verified to a pH <2. The samples are stored at room temperature.

8.2.2 Soil/Sediment/Sludge samples - these samples are preserved in a refrigerator at ≤ 4 °C. Alternatively, the samples may be stored at ≤ -20 °C in a freezer.

8.2.3 Biological Tissue samples - The samples are stored at ≤ -20 °C in a freezer.

8.2.4 Drum Samples – There is no temperature requirement for these samples.

8.3 Holding time

8.3.1 Aqueous samples must be prepared and analyzed within six months of collection.

8.3.2 Soil/Sediment/Sludge samples must be digested and analyzed within six months of collection.

If soil/sediment samples are stored at ≤ -20 °C, the holding time is extended. The samples must be prepared within 12 months of collection and analyzed within 6 months of digestion.

8.3.3 Biological Tissue samples must be digested within 12 months of collection and analyzed within 6 months of digestion.

8.3.4 Drum Samples - a holding time is not established for the digestion or analysis of these samples.

9. Sample Preparation

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- 9.1 Sample preparation is recorded in Element Batch/Bench Sheets (see SOP #G-28). Sample weights for solid samples are documented in the Sample Preparation Log Book (see SOP #G-9).
- 9.2 All Environmental samples, e.g., aqueous, soil/sediment, and biological tissue, including NPDES wastewater compliance monitoring samples, are digested in a mixture of acids using the procedures described in SOP # C-116 "Preparation of Aqueous, TCLP Extracts Soil/Sediment, Sludge/Solid, Biological Tissue and Other Matrices by Block Digestion".
- 9.3 For the "direct analysis" of total recoverable analytes in samples with turbidity < 1.0 NTU, or for samples designated for analysis of "dissolved" analytes, (filtered through a 0.45 micron filter), the samples can be analyzed directly, without any further preparation.

10. Instrument Operating Conditions

The analyst should follow the manufacturer's instructions for each instrument unless other conditions provide better performance.

- 10.1 IRIS - Before lighting the plasma, make sure the following settings are in place:

RF power - 1150W
Auxiliary Gas – 0.5 L/min
Nebulizer Flow Rate – 0.50 L/min
Pump Rate – (Flush and Analysis) – 120 rpm

Note: Setting ranges are specified at safe or near optimum values, but may be adjusted as necessary.

Allow the plasma to become stable (about 45 minutes).

- 10.2 iCAP 6300 - Before lighting the plasma, make sure the following settings are in place:

Recirculating Chiller – 15-25 °C, 5L/minute flow
RF power – 1100 – 1200 W
Regulated Argon Pressure – 90-100 psi
Auxiliary Gas – 0.5 L/min
Nebulizer Flow Rate – 0.2 – 0.3 MPa (manually set)
Flush Pump Rate – 60 – 80 rpm
Analysis Pump Rate – 35 – 45 rpm

Note: Setting ranges are specified at safe or near optimum values, but may be adjusted as necessary.

Allow the plasma to become stable (about 45 minutes).

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- 10.3 Instrument maintenance records are documented in the Instrument Log Book (see SOP #G-9) for routine daily maintenance items. Major repairs and annual PM'S are recorded the Element Instrument Maintenance Log (see SOP #G-28) for each instrument.

11. Sample Analysis

- 11.1 Configure the instrument settings to those in Section 10. Choose a method from the instrument ANALYST window. Operating parameters and values are assigned for each category in the METHOD Tab.
- 11.2 Prepare an Element Sequence (refer to SOP #G-28 and Working with Promium). Export the Element Sequence to the Met Lab. Drive. Transfer the sample numbers (copy/paste) to the sample ID File on the instrument SEQUENCE tab. Promium ID #'s for the check standards [ICV/CCV, ICB/CCB, LCV's (RL, 2 RL), IFA (IEC)] are applied at the instrument (copy/paste) in the ANALYSIS tab using the change sample ID function. Calibration Promium ID #'s are entered by using the replace function in Data Tool.
- 11.3 Calibrate the instrument using the Calibration Blank Solution and Mid and High Standard mixed calibration solutions. The average of three readings is to be used. Follow with the initial check standards (ICV, ICB LCV'S and IFA). Adequately flush the system with the rinse blank solution between each determination. A calibration blank and a single mixed standard or any other suitable combinations of standards/concentrations/elements may also be used to standardize/calibrate the IRIS or iCAP 6300.
- 11.4 Analyze the samples in the same operational manner used in the standardization routine with a rinse blank or sample flush period also being used between all sample and check standard solutions.
- 11.5 The routine sample analysis protocol is as follows:

Calibration Blank

Mixed Calibration Standards (Mid and High Standard)

ICV

ICB

Low Check Standards - LCV's (RL and 2RL)

IFA (IEC)

Prep Blank (PB/BLK)

LCS's (BS/BSD)

Environmental Samples

Matrix Spike and Serial Dilution (MS and SD) at required frequency)

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CCV
CCB
Low Check Standards - LCV's (RL and 2RL)
IFA (IEC)

The CCV/CCB is repeated after a minimum of every 10 samples and at the end of the run.

- 11.6 During the analysis of samples, the laboratory must comply with the required quality control in Sections 14.
- 11.7 Determined sample analyte concentrations that are 90% or more of the upper limit of the analyte LDR must be diluted with Blank Solution and reanalyzed.
- 11.8 All aqueous samples, analyzed by the usual digestion procedure, with results for Ag > 200 ppb, must be reanalyzed. The sample must be diluted prior to digestion so that the final Ag concentration in the analysis solution is < 200 ppb.
For solid samples with results for Ag > 100 mg/kg, the samples must be reanalyzed using a smaller sample size. The final digestate should not contain > 1000 ppb Ag.
- 11.9 Report Data as directed in Section 12.
- 11.10 Instrument Logbook - Entries are made in the Instrument Logbook (see SOP #G-9) for each sample run for information not documented in Element along with any analysis notes or comments.

12. Data Analysis and Calculations

12.1 Aqueous Samples - undigested

All dilution factors required as a result of dilutions made during analysis are applied at the instrument. All of the aqueous sample results generated from the analysis (in µg/L) can be reported directly from the instrument.

12.2 Aqueous Samples - Digested

All dilution factors required as a result of the digestion procedure or dilutions made during analysis are applied at the instrument. All of the aqueous sample results generated from the analysis (in µg/L) can be reported directly from the instrument.

- 12.3 All aqueous sample results are uploaded into Element. Results are reported to two significant figures and in most cases, are reported down to the standard reporting limits listed in Table 2.

12.4 Non-Aqueous (Soil/Sediment/Sludge and NAPL) Samples

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All dilution factors required as a result of dilutions made during analysis are applied at the instrument. All of the results, generated from the analysis (in µg/L), can be used directly from the instrument.

These results in µg/L are uploaded into Element which calculates the final result in mg/Kg. The sample weight (g) and the percent solids must be entered on the Bench Sheet in order for Element to calculate the final result on a dry weight basis.

All mg/kg results are reported to two significant figures and, in most cases, are reported down to the standard reporting limits listed in Table 2.

12.5 Manual Calculation for converting the µg/L results to mg/Kg:

The µg/L result is multiplied by the final digestate volume in Liters, usually 0.050 L, and divided by the sample mass in grams, usually 0.50 g (the specific sample volume and mass are recorded in the metals sample preparation log book and/or on the Element Bench Sheet). For dry weight calculation, the mg/Kg results must be divided by the percent solids. (See SOP #G-23 for Percent Dry Solids.)

$$\text{Sample Result, mg / Kg, (dry weight basis)} = \frac{\mu\text{g / L} \times V}{W \times (\% \text{ Solids} / 100)}$$

Where

µg/L = Instrument reading (average of three replicates)
V = Final sample volume in liters (e.g. 0.050L)
W = Weight of wet sample in grams (e.g. 0.50g)

12.6 Manual Calculation for TCLP Extracts – TCLP extracts are analyzed at a 10X dilution and are reported in mg/L.

$$\text{Sample Result, mg / L} = \frac{\text{Instrument Reading}(\mu\text{g / L}) \times 10}{1000}$$

13. Method Performance

A demonstration of capability (DOC) must be performed each time there is a significant change in the chemistry of the method, a major modification to an existing instrument, or a new instrument is installed. A DOC is performed by each analyst designated to analyze samples using this method. An annual check must subsequently be performed and documented for each analyst using this method.

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13.1 Accuracy and Precision

13.1.1 Demonstration of Capability

An initial demonstration of capability study must be conducted and documented for each analyst using this method for both aqueous and soil matrices. The study consists of the analysis of four standards which are from a source independent of the standard curve. Aqueous LCS standards must be within $\pm 15\%$ of the true value. Solid LCS's and Soil SRM's must be within the acceptance criteria supplied by the manufacturer or within $\pm 25\%$ of the true value if none are specified. The % RSD must be within 20%. The results of the accuracy and precision study (true value, % recovery, standard deviation and %RSD) are maintained by the Quality Assurance Officer for each analyst and are located in the Laboratory's Central File.

13.1.2 Continuing Demonstration of Capability

An annual continuing demonstration of capability study must be performed and documented for each analyst using this method for both aqueous and soil matrices. It may consist of either successfully analyzing a PT sample or analyzing 2 sets of Aqueous or Solid LCS's or Soil SRM's to within control limits as stated in section 13.1.1. The results of the continuing accuracy and precision study (true value, % recovery, standard deviation and % RSD or final report from the PT provider) are maintained by the Quality Assurance Officer for each analyst and are located in the Laboratory's Central File.

13.2 Method Detection Limit (MDL)

An MDL Study must be conducted for this method. The study is based on the requirements listed in 40 CFR Part 136 Appendix B. Specific procedures for conducting an MDL study can be found in SOP # G-8. The MDL Study comprises the analysis of seven reagent grade water samples fortified at a level between 2-3x the detection limit. The results of the MDL determination (true value, average concentration, standard deviation and calculated MDL) are maintained by the Quality Assurance Officer for each method and are located in the Laboratory's Central File.

13.3 Linear Dynamic Range (LDR)

The LDR must be determined by generating a normal linear calibration curve followed by the analysis of successively higher standard solutions. The results of these standard solutions are used to calculate % recovery. This is conducted until the % recovery falls below 90%. The last standard that had a % recovery of at least 90% is identified as the LDR limit.

The LDR should be verified annually or whenever in the judgement of the analyst, there is a change in analytical performance due to a significant change in instrument hardware or operating conditions.

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The results of the LDR Study are maintained by the Quality Assurance Officer and are located in the Laboratory's Central File.

13.4 Limit of Quantitation (LOQ)

The Laboratory performs a Limit of Quantitation (LOQ) study on an annual basis for analytes associated with chemistry methods. The validity of LOQ is confirmed by successful analysis of a Laboratory Fortified Blank (LFB) at approximately 2X the reporting limit. The acceptance criteria for each analyte is $\pm 30\%$ of the true value. After this study is completed, it is reviewed and approved by the Laboratory Management. A summary of all LOQ study performance is maintained in the Laboratory's Central File.

14. Quality Control

14.1 Calibration Curve

The IRIS and iCAP6300 are calibrated using a Mid and High standard and a calibration blank. The correlation coefficient for each analyte of interest must be ≥ 0.995 .

A single mixed standard or any other suitable combinations of standards/concentrations/individual elements may be used to standardize/calibrate the IRIS. Acceptance criteria remain the same.

After standardization, the ICV and ICB are used to determine acceptance.

Corrective Action - If the results of the ICV or ICB are unacceptable, analysis must be discontinued, the cause determined and/or in the case of drift the instrument re-calibrated.

14.2 Instrument Performance Check (IPC)/Initial Calibration Verification (ICV)

Acceptance Criteria - Analyze the ICV solution from a separate identifiable source (different lot number or vendor from that of calibration standards) for all analytes of interest immediately following the calibration. The result of the ICV solution must be within $\pm 5\%$ of the true value for NPDES compliance monitoring samples and $\pm 10\%$ for all other samples.

Corrective Action - If the calibration cannot be verified within the specified limits, re-analyze the ICV solution. If the results of the second analysis of the ICV solution are not within the acceptance limits for both types of samples (NPDES compliance monitoring samples and other samples), the analysis must be discontinued, the cause determined and the instrument re-calibrated. If the results of the second analysis of the ICV solution are not within the acceptance limits of NPDES requirements but within the acceptance limits for other program samples, a case narrative must be issued for samples that are non-compliant.

14.3 Instrument Performance Check (IPC)/Continuing Calibration Verification (CCV)

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Acceptance Criteria - Analyze the CCV solution, from the same source as that used for the ICV, after a maximum of ten samples and at the end of the sample run. The results of each CCV solution must be within $\pm 10\%$ of the true value for NPDES compliance monitoring samples and $\pm 20\%$ for all other samples for all analytes of interest.

Corrective Action - If the calibration cannot be verified within the specified limits, re-analyze the CCV solution. If the results of the second analysis of the CCV solution are not within the acceptance limits, the analysis must be discontinued, the cause determined and the instrument re-calibrated. All samples following the last acceptable CCV solution must be reanalyzed.

14.4 Initial Performance Blank /Continuing Performance Blank (IPB/CPB) - Initial Calibration Blank/Continuing Calibration Blank (ICB/CCB)

Acceptance Criteria - Analyze a calibration blank immediately following each ICV/CCV. All ICB/CCB results must be $<$ the |Reporting Limit| for each element of interest.

Corrective Action - If the result of the ICB/CCB is $>$ |Reporting Limit|, the analysis should be discontinued, the problem identified, and the ICB/CCB reanalyzed. If the ICB/CCB results remain $>$ |Reporting Limit|, the instrument must be recalibrated.

14.5 Laboratory Reagent Blank (LRB)/Prep Blank (PB/BLK)

Analyze one PB/BLK for each batch of 20 or fewer samples per matrix.

Acceptance Criteria - The PB/BLK results must be $<$ the |Reporting Limit|.

Corrective Action - If the result of the PB/BLK is $>$ |Reporting Limit|, then all associated samples with a concentration of $< 10X$ the amount found in the PB/BLK should be reprepared and reanalyzed. If the samples cannot be reprepared, then all affected sample results must be either: qualified accordingly, or the Reporting Limit is raised to the amount found in the sample. Check with the team leader/section chief to determine which option should be used.

Sample results $\geq 10X$ the amount found in the PB/BLK are not considered to be affected by the blank contamination or drift, so no corrective action is needed.

14.6 Laboratory Fortified Blank (LFB)/ Laboratory Control Samples (LCS) / Blank Spike – Blank Spike Duplicate (BS-BSD) Solid Laboratory Control Sample (Solid LCS/SRM).

14.6.1 Aqueous LFB/LCS/BD-BSD

Acceptance Criteria - Analyze two aqueous LCS (BS-BSD) samples with each batch of aqueous samples of 20 or less. Calculate accuracy as percent recovery using the following equation:

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$$\% Recovery = \frac{\text{Average of 2 LFB/LCS's}}{s} \times 100$$

where:

LFB/LCS (BD-BSD) = laboratory fortified blank/laboratory control sample result
s = concentration of analytes added to fortify the LFB/LCS/BS-BSD solution

The %Recovery of the aqueous LCS/BD-BSD must be within $\pm 15\%$ of the true value for NPDES wastewater compliance monitoring samples and within $\pm 20\%$ of the true value for all other environmental samples. The RPD of the duplicate LCSs should be $< 20\%$.

Corrective Action - If the %Recovery or %RPD results are outside the required control limits, the affected samples should be reprepared and reanalyzed. If the samples cannot be reprepared, then all affected sample results must be qualified accordingly.

14.6.2 Solid LCS/SRM

Acceptance Criteria - Analyze two solid LCS/SRM samples with each batch of solid samples of 20 or less. Calculate accuracy as percent recovery using the following equation:

$$\% Recovery = \frac{\text{Average of 2 LCS's, (mg/Kg)}}{\text{True Value, (mg/Kg)}} \times 100$$

The True Value for the solid LCS/SRM is available through the certificate of analysis supplied by the vendor. The %Recovery of the solid LCS/SRM must be within $\pm 25\%$ of the true value or within the limits established by the vendor. The RPD of the duplicate LCS/SRM's should be $< 25\%$.

Corrective Action - If the %Recovery or %RPD results are outside the required control limits, the affected samples should be reprepared and reanalyzed. If the samples cannot be reprepared, then all affected sample results must be qualified accordingly.

14.6.3 Biological Tissue LCS/SRM

Acceptance Criteria - Analyze two Biological Tissue LCS/SRM samples with each batch of tissue samples of 20 or less. Calculate accuracy as percent recovery using the following equation:

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$$\% Recovery = \frac{\text{Average of 2 LCS's, (mg/Kg)}}{\text{True Value, (mg/Kg)}} \times 100$$

The %Recovery of the tissue LCS/SRM must be within $\pm 50\%$ of the true value or within the limits established by the vendor. The RPD of the duplicate LCS/SRM's should be $< 50\%$.

Corrective Action - If the %Recovery or %RPD results are outside the required control limits, the affected samples should be reprepared and reanalyzed. If the samples cannot be reprepared, then all affected sample results must be qualified accordingly.

14.7 Laboratory Fortified Matrix (LFM)/Matrix Spike (MS) Recovery

Acceptance Criteria - One Laboratory Fortified Matrix (LFM)/Matrix Spike (MS) is prepared for each matrix per project with at least one MS per batch of 10 or fewer NPDES samples or one MS per batch of 20 or fewer samples for other programs. The MS aliquot must be a duplicate of the aliquot used for sample analysis. When possible, the concentration should be the same as that added to the aqueous LCS, but should not exceed the midpoint concentration of the calibration curve. Calculate the percent recovery, corrected for background concentration measured in the unfortified sample aliquot, and compare these values to the control limits to the designated matrices' recovery ranges : $\pm 20\%$ for aqueous samples; $\pm 25\%$ for solid samples (soils, sediment, and NAPL); and $\pm 50\%$ for sludge and biological tissue samples. Percent recovery is calculated using the following equation:

$$R = \frac{C_s - C}{s} \times 100$$

where:

R = percent recovery,
Cs = fortified sample concentration,
C = sample background concentration, and
s = conc. equivalent of metal added to sample.

Corrective Action - If %Recovery of the MS is outside the required control limits, and the laboratory performance is shown to be in control, the recovery problem encountered is judged to be matrix related, not system related. The native sample result of the sample used to produce the MS must be qualified accordingly.

The % recovery of the MS is not evaluated if the result of the unfortified sample concentration is $> 1X$ the level used to fortify the sample.

14.8 Serial Dilution Test

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Acceptance Criteria - Analyze a 20% dilution of each MS sample. Each serial diluted sample result, adjusted for the dilution, should agree with the MS result to within 10% Difference (%D).

Corrective Action - If the % Difference is outside the required control limits, and the laboratory performance is shown to be in control, the precision problem encountered is judged to be matrix related, not system related, and the sample should be qualified accordingly.

Calculation:

$$\% \text{ Difference} = \frac{|I - S|}{I} \times 100$$

where:

I = Initial MS Result (Instrument reading)
S = Serial Dilution Result (Instrument reading x5)

14.9 Low-Level Checks (RL and 2RL) / Low Calibration Verification (LCV)

Acceptance Criteria - Analyze the LCV's (RL and 2RL) standards, immediately following the ICV and ICB and at the end of the run prior to the final IFA (IEC) analysis. The %Recovery of the LCV's (RL and 2RL) must be within $\pm 30\%$ of the true value for all analytes of interest.

Corrective Action –

If the RL cannot be verified within the specified limits of $\pm 30\%$ for any analytes of interest, re-analyze the RL solution immediately for those analytes of concern only. If the results of the re-analysis for those analytes fall within the control limits, no further corrective action is required.

If the results of the RL re-analysis for those analytes do not fall within the control limits or if the RL standard cannot be reanalyzed, but the 2RL is within limits, then the Reporting Limit is raised to the 2RL level as long as the sample project requirements allow. For projects where the 2RL levels are not acceptable the analysis must be discontinued; the cause determined, the instrument re-calibrated and samples re-analyzed. If the samples cannot be reanalyzed, then all affected sample results must be qualified accordingly.

If the 2RL cannot be verified within the specified limits of $\pm 30\%$ for any analytes of interest, re-analyze the 2RL solution immediately for those analytes of concern only. If the results of the re-analysis for those analytes fall within the control limits, no further corrective action is required.

If the results of the 2RL re-analysis for those analytes do not fall within the control limits or if the 2RL standard cannot be reanalyzed, then the Reporting Limit may be raised to the next check standard (ICV/CCV or LCS), as long as the sample project requirements allow.

For projects where the 2RL levels are not acceptable, the analysis should be discontinued; the

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cause determined, the instrument re-calibrated and samples re-analyzed. If the samples cannot be reanalyzed, then all affected sample results must be qualified accordingly.

For samples with results > the next check standard (ICV/CCV or LCS), no further actions is necessary.

If the RL is acceptable, but the 2RL is unacceptable, samples with values >RL but < the next check standard (ICV/CCV or LCS), must be re-analyzed or qualified accordingly.

14.10 Spectral Interference Check - -Inter-Element Correction Solution IEC/IFA

Acceptance Criteria - All metal sample results, except for Al, Fe, Ca, Mg, and Na, should be < the [Reporting Limit.] as listed in Table 2.

A corrective action is not required if one of the following conditions is met:

1. If the metal that is “affected” by the interferent is not required for the project in question;
2. If the concentration of the metal that is “affected” by the interferent is < the [Reporting Limit];
3. If the concentration of the metal causing the interference in the “affected” environmental sample is at a trace level, i.e., <10,000 ug/L (the level used in our mixed calibration high standard)

14.11 Triplicate Integrations

Acceptance Criteria - Each analysis consists of three separate integrations or readings. This includes the calibration standards, quality control samples and all associated environmental samples. The average of the three measurements is used for reporting results. The %RSD must be <20% for all results that are > the reporting limit.

Corrective Action - If the %RSD for a calibration standard, quality control sample and/or an environmental sample is outside the control limits, the analysis must be repeated. If the %RSD is still outside the control limits, the analysis must be discontinued and repeated after correcting the problem. If the %RSD any sample is still outside the control limits and the laboratory performance, i.e. CCV, is shown to be in control, the %RSD problem encountered is judged to be matrix related, not system related. These samples are qualified accordingly.

14.12 Triplicate Analyses

Biological Tissue Samples – One sample per batch of 20 or fewer Biological tissue samples must be digested and analyzed in triplicate. The result of the first analysis is reported. The %RSD of the three analyses must be $\leq 25\%$.

Corrective Action - If the %RSD results are outside the required control limits, the affected samples should be reprepared and reanalyzed. If the samples cannot be reprepared, then all affected sample results must be qualified accordingly.

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15. Reporting and Validation

15.1 Reporting Limits - The reporting limits are calculated based on MDL studies for each of the instruments and have been set wherever possible at from ½ CRQL levels, to the CRQL level, maximum. The reporting limits are matrix and dilution dependent. All results are reported to 2 significant figures. Solid matrices are normally reported on a dry weight basis. The standard reporting limits for both aqueous and non-aqueous samples are listed in Table 2.

15.2 Data Transfer

At the conclusion of the analysis run, create a Project Folder to collect the data from the run (Project Number Project Name). Save to the instrument computer or to the ICP folder on the Met Lab Drive. (ESAT uses a Flash Drive to transfer data from the instrument computer to Element).

Complete any reprocessing as necessary. Save the instrument sequence.

Using the instrument “Publisher” screen, create and export a copy of the run both in Acrobat and Excel format. Save both files to the project folder. The Acrobat file (MMDDYY vertical table report.pdf) serves as a permanent electronic copy of the run. The Excel file (MMDDYY vertical table.xls) is available for manual data evaluation. A macro is used to process this file for use as a run sequence file and to evaluate QC and produce QC Summary forms if necessary.

Export the instrument sequence. The sequence is saved in the Export folder on the instrument computer as a text file (MMDDYY.txt). Copy this file to the Project Folder for upload into Element. Refer to SOP-G-28 and “Working with Promium”.

The analyst must check that correlation coefficients are ≤ 0.995 from the raw data. Print a copy of the calibration report for inclusion in the data package.

Element will evaluate the QC for: ICV/CCV, ICB/CCB, Low Level Checks, Matrix Spike Recoveries Serial dilution, RPD's and LDR.

Add the Reviewer Checklist and complete all entries.

When the data evaluation is complete, the analyst must then update the sample status to “ANALYZED” in Element for each sample in the analytical batch.

For sample results not reported directly from the instrument, a sample calculation for one analyte using a detect result (if possible) must be included in the data package. The calculation will begin with the sample result generated from the instrument and end with the result reported. It is the responsibility of the peer reviewer to verify the accuracy of the

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calculations performed.

This sample calculation is not necessary for sample results reported directly from the instrument (i.e.: if no data reduction/manipulation is performed on the sample results between the instrument output and final results reported). For multi-analyte methods, only one analyte needs to be carried through in the sample calculation representing the group.

15.3 Sample Data Package

The sample data package should include but not be limited to the following:

1. Project Data Cross Reference Form
2. ICAP-AES QA/QC Checklist with all relevant information entered - prepared by the Analyst, printed by the Data Validator
3. Element Sequence Sheet
4. Instrument Analysis Log
5. Element Bench Sheet
6. Sample Preparation Log, if required
7. Calibration Report
8. Instrument Sequence
9. QC Summary Forms, if needed
10. Percent solids Log, if required
11. Sample manual calculation, if required
12. Instrument generated raw data

15.4 Data Validation

Data review is performed by a second analyst not involved in the analysis of the given analytical batch, but knowledgeable in the analytical processes employed. (See SOP #G-26 Data Review).

The peer reviewer verifies and prints the QC checklist in Element to indicate that the data have been reviewed and all QC criteria have been met or qualified accordingly. The status is then updated to "PEER REVIEWED" in Element for each sample in the analytical batch.

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15.5 Data Records

The data package is filed under one designated project file. All other projects associated with the data package are referenced to this designated project file via a “cross reference form”. A “cross reference form” is placed in each of the project files that were associated with the data package.

Once all data from each project has been reviewed by the appropriate staff and the final report issued, the project files are stored in the locked record cabinets in the Laboratory Office area.

16. Pollution Prevention

- 16.1 Pollution prevention encompasses any technique that reduces or eliminates the quantity or toxicity of waste at the point of generation. Numerous opportunities for pollution prevention exist in laboratory operation. The EPA has established a preferred hierarchy of environmental management techniques that places pollution prevention as the management option of first choice. Whenever feasible, laboratory personnel should use pollution prevention techniques to address their waste generation. When wastes cannot be feasibly reduced at the source, the Agency recommends recycling as the next best option.
- 16.2 The quantity of chemicals purchased should be based on expected usage during its shelf life and disposal cost of unused material. Actual reagent preparation volumes should reflect anticipated usage and reagent stability.
- 16.3 For information about pollution prevention that may be applicable to laboratories and research institutions, consult *Less is Better: Laboratory Chemical and Management for Waste Reduction*, available from the American Chemical Society's Department of Government Relations and Science Policy, 1155 16th Street N.W., Washington D.C. 20036, (202)872-4477.

17. Waste Management

The USEPA requires that laboratory waste management practice be conducted consistent with all applicable rules and regulations. Excess reagents, samples and method process wastes should be characterized and disposed of in an acceptable manner. The agency urges laboratories to protect the air, water and land by minimizing and controlling all releases from hoods and bench operations, complying with the letter and spirit of any water discharge permit and regulations, and by complying with all solid and hazardous waste regulations, particularly the hazardous waste identification rules and land disposal restrictions. For further information on waste management consult the Region 2 SOP #G- 6, *“Disposal of Samples and Hazardous Wastes and Chemical Inventory Management”*.

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18. References

- 18.1 Environmental, Health and Safety Operations Manual & Chemical Hygiene Plan, EPA Region 2, Current Version
- 18.2 Laboratory Quality Management Plan (LQMP), U.S. Environmental Protection Agency, Region 2 Laboratory Branch, Current Version
- 18.3 U. S. Environmental Protection Agency, “*Determination of Metals and Trace Elements in Water and Wastes by Inductively Coupled Plasma-Atomic Emission Spectrometry*”, Method 200.7, Revision 4.4, May, 1994
- 18.4 U. S. Environmental Protection Agency, Region 2, SOP #C-116 “*Preparation of Aqueous, TCLP Extracts, Soil/Sediment/Sludge/Solid, Biological Tissue and Other Matrices by Block Digestion*”
- 18.5 Method 2340 B “*Hardness by Calculation*” Standard Methods for the Examination of Water and Wastewater, 20th Edition-1998
- 18.6 U. S. Environmental Protection Agency, Solid Waste 846, Test Methods for Evaluating Solid Waste, Physical/Chemical Methods, Method 6010C “*Inductively Coupled Plasma - Atomic Emission Spectrometry*”, Laboratory Manual, Revision 3, November 2000
- 18.7 U. S. Environmental Protection Agency, Region 2, SOP #G-6 “*Disposal of Samples and Hazardous Wastes and Chemical Inventory Management*”
- 18.8 U. S. Environmental Protection Agency, Region 2, SOP #G-8 “*Laboratory Policy for the Determination of Method Detection Limits (MDLs)*”
- 18.9 U. S. Environmental Protection Agency, Region 2, SOP #G-9, “*Laboratory Policy For The Establishment And Maintenance Of Logbooks Associated With Chemical Analysis*”
- 18.10 U. S. Environmental Protection Agency, Region 2, SOP #G-15 “*Laboratory Definitions and Data Qualifiers*”
- 18.11 U. S. Environmental Protection Agency, Region 2, SOP #G-23 “*Percent Dry Solids*”
- 18.12 U. S. Environmental Protection Agency, Region 2, SOP #G-26, “*Guidance for Laboratory Data Review*”
- 18.13 U. S. Environmental Protection Agency, Region 2, SOP #G-28, “*Laboratory Operations using ‘Element’ LIMS*”

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- 18.14 Promium Element Data System, Laboratory Information Management Systems, Promium, LLC, Current Version
- 18.15 Working with Promium, Current Version

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Table 1. Standard Solutions Preparation:

Standard/Solution Name	Concentration Required
Calibration Blank/Rinse Blank/ICB/CCB	Reagent grade water, acidified to 2% HNO ₃ and 5% HCl
High Standard - IRIS	10,000 ppb for Al, Ca, Fe, Mg, K, Na and Si 1000 ppb for Ag, As, B, Ba, Be, Cd, Co, Cr, Cu, Mn, Mo, Ni, Pb, Se, Sb, Sn, Sr, Ti, Tl, V, and Zn
Mid Standard - IRIS	5,000 ppb for Al, Ca, Fe, Mg, K, Na and Si 500 ppb for Ag, As, B, Ba, Be, Cd, Co, Cr, Cu, Mn, Mo, Ni, Pb, Se, Sb, Sn, Sr, Ti, Tl, V, and Zn
ICV/CCV IRIS	200 ppb for Ag, As, B, Ba, Be, Cd, Co, Cr, Cu, Mn, Mo, Ni, Pb, Se, Sb, Sn, Sr, Ti, Tl, V, and Zn 5,000 ppb for Al, Ca, Fe, Mg, K, Na and Si
RL	All elements at Reporting Limit levels
2RL	All elements at 2X Reporting Limit levels.
IEC Solution	300,000 ppb Al, Ca, Fe, Mg and Na
High Standard – iCAP 6300	10,000 ppb for Al, Ca, Fe, Mg, K, Na, Ag, As, Ba, Be, Cd, Co, Cr, Cu, Mn, Mo, Ni, Pb, Se, Sb, Ti, Tl, V, and Zn (B, Si, Sn, Sr- optional) 1,000 ppb for Ag
Mid Standard – iCAP 6300	5,000 ppb for Al, Ca, Fe, Mg, K, Na, Ag, As, Ba, Be, Cd, Co, Cr, Cu, Mn, Mo, Ni, Pb, Se, Sb, Ti, Tl, V, and Zn (B, Si, Sn, Sr- optional) 500 ppb for Ag
ICV/CCV iCAP 6300	200 ppb for Ag, As, Ba, Be, Cd, Co, Cr, Cu, Mn, Mo, Ni, Pb, Se, Sb, Ti, Tl, V, and Zn (B, Sn, Sr- optional) 5,000 ppb for Al, Ca, Fe, Mg, K, and Na (Si optional)
Internal Standard IRIS	10 ppm Y
Internal Standard iCAP 6300	3,000 ppm Cs, 10 ppm Y

All standard solutions are prepared using reagent water Reagent grade water, acidified with 2% HNO₃ and 5% HCl

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Table 2. ICP-AES - Reporting Limits - Aqueous and Solid (Soil/Sediment/Sludge)


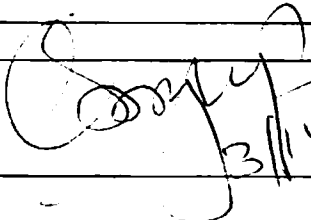
Element/ Wavelength (nm) IRIS	Element/ Wavelength (nm) iCAP 6300	Reporting Limit µg/L Aqueous	Reporting Limit mg/Kg Solid
Ag 328.0 A	Ag 328.0 A	5	0.5
Al 396.1 R	Al 396.1 R	100	10
As 189.0 A	As 189.0 A	8	0.8
B 208.9 A	B 208.9 A	10	1
Ba 455.4 R	Ba 455.4 R	100	10
Be 313.1 R	Be 313.1 R	3	0.3
Ca 317.9 R	Ca 317.9 R	500	50
Cd 214.4 A	Cd 226.5 A	3	0.3
Co 228.6 A	Co 228.6 A	20	2
Cr 205.5 A	Cr 267.7 A	5	0.5
Cu 324.7 A	Cu 324.7 A	10	1
Fe 259.9 A		50	5
Fe 259.9 R	Fe 259.9 R	50	5
K 766.4 R	K 766.4 R	500	50
Mg 279.0 R	Mg 279.0 R	500	50
Mg 285.2 R		500	50
Mn 257.6 A	Mn 257.6 A	5	0.5
Mo 202.0 A	Mo 202.0 A	10	1
Na 589.5 R	Na 589.5 R	1000	100
Ni 231.6 A	Ni 231.6 A	20	2
Pb 220.3 A	Pb 220.3 A	8	0.8
Sb 206.8 A	Sb 206.8 A	20	2
Se 196.0 A	Se 196.0 A	20	2
Si 251.6 R	Si 288.1R	500	50
Si 251.6 A	Si 2881 A	15	0.15
Sn 189.9 A	Sn 189.9A	10	1
Sr 407.7 R	Sr 364.4R	10	1
Ti 334.9 A	Ti 337.2 A	10	1
Tl 190.8 A	Tl 190.8 A	20	2
V 272.4 A	V 292.4 A	20	2
Zn 206.2 A	Zn 206.2 A	20	2

Notes

- 1) The Reporting Limits were set wherever possible at ½CRQL levels, maximum. Pb is 0.8X CRQL level.
- 2) A: Axial View, R: Radial View

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REQUEST FOR SOP CHANGE

Initiator Name:	Renee Lettieri	Date of Initiation:	3/4/2013
Dept :	Metals	SOP #:	C-109
		Revision #:	3.2
SOP Title:	DETERMINATION OF METALS IN AQUEOUS, TCLP EXTRACTS, SOIL/SEDIMENT, SLUDGE, AND BIOLOGICAL TISSUE SAMPLES BY INDUCTIVELY COUPLED PLASMA-ATOMIC EMISSION SPECTROMETRY		
Please Check One		MINOR REVISION <input checked="" type="checkbox"/>	MAJOR REVISION <input type="checkbox"/>
CHANGE(S) (Use attachment if necessary):			
See attachment			
REASON(S) FOR CHANGE(S):			
The time samples must be held at pH <2 prior to sample processing after preservation has been changed from 16			
hours to 24 hours.			
APPROVAL	NAME:	Signature/Date	
EPA Section Chief/ Team Leader	G.T. SANTACRUZ Per: John Bourbon	 3-12-13	
ESAT Analytical Supervisor/ QAO			
EPA Task Order Project Officer	Ness Tirol		
Effective Date	Sumy Cherukara	 3/14/13	
3/14/13	EPA QAO		

Change:

- 8.2.1 Aqueous samples - the samples are preserved using concentrated HNO_3 . The preservation is performed either in the field at the time of collection, or in the Laboratory upon receipt (within five days). If the samples are preserved in the Laboratory, they must be held for sixteen hours after acidification and then verified to a $\text{pH} < 2$ prior to sample processing. If the sample pH is verified to be $\text{pH} > 2$ after the sixteen hours, additional HNO_3 must be added and the sample held for an additional sixteen hours until verified to a $\text{pH} < 2$. The samples are stored at room temperature.

To

- 8.2.1 Aqueous samples - the samples are preserved using concentrated HNO_3 . The preservation is performed either in the field at the time of collection, or in the Laboratory upon receipt (within five days). If the samples are preserved in the Laboratory, they must be held for 24 hours after acidification and then verified to a $\text{pH} < 2$ prior to sample processing. If the sample pH is verified to be $\text{pH} > 2$ after the 24 hours, additional HNO_3 must be added and the sample held for an additional 24 hours until verified to a $\text{pH} < 2$. The samples are stored at room temperature.